

*A Report of the 47th Northeast Regional Stock Assessment Workshop*

**47th Northeast Regional  
Stock Assessment Workshop  
(47th SAW)**

**Part B. Assessment Report Appendixes**

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## APPENDIX 1

### SAW 47 Working Paper 1 (TOR 1) – Commercial Fishery Discards

December 10, 2007

#### Estimation of Commercial Fishery Discards of Summer Flounder: Update 2007 or Revise the 1989-2007 Time Series?

##### Background

In the 1993 SAW 23 assessment for summer flounder (NEFSC 1993), an analysis of variance of fishery observer data for summer flounder was used to identify stratification variables for an expansion procedure to estimate total landings and discards from the observer data kept and discard rates (weight per day fished) in the commercial fishery. Initial models included year, quarter, fisheries statistical division (2-digit area), area (divisions north and south of Delaware Bay), and tonnage class as main effects. Quarter and division consistently emerged as significant main effects without significant interaction with the year effect. The estimation procedure expanded transformation bias-corrected geometric mean catch (landings and discards) rates in year, quarter, and division strata by total days fished (days fished on trips landing any summer flounder by any mobile gear, including fish trawls and scallop dredges) to derive fishery landings and discards (hereafter called the “mean log ratio with correction” method). The “days fished” effort metric was found to correlate better with the observed summer flounder discards on a per trip basis than other potential expansion factors such as total summer flounder landings or total trip landings of all species. The use of fishery effort as the multiplier (raising factor) also allowed estimation of landings from the fishery observer data for comparison with dealer reported landings, to help judge the potential accuracy of the procedure and/or sample data.

For strata with no fishery observer sampling, catch rates from adjacent or comparable strata were substituted as appropriate (except for Division 51, which generally has very low catch rates and negligible catch). Estimates of discard were stratified by 2 gear types (scallop dredges; trawls) for years when data were adequate (1992 and later years). Estimates at length and age were stratified by gear for 1994-2000 and 2002-2006, again due to sample size considerations. Only 11 fish were sampled from the sea scallop dredge fishery 2001, and so the scallop dredge discards were assumed to have the same length and age composition as the trawl fishery discards in 2001.

The change in mid-1994 from the interview/weighout data reporting system to the VTR/mandatory dealer report system required a change in the estimation of effort (days fished) to estimate total discards. An initial examination of days fished and catch per unit effort (CPUE; landings per day fished) for cod conducted at SAW 24 (NEFSC 1997a) compared these quantities as reported in the full weighout and VTR data sets (DeLong *et al.*, 1997). This comparison indicated a shift to a higher frequency of short trips (trips with one or two days fished reported), and to a mode at a lower rate of CPUE. It was not clear at SAW 24 if these changes were due to the change in reporting system (units reported not comparable), or real changes in the fishery, and so effort data reported by the VTR system were not used

quantitatively in the SAW 24 assessments. In the SAW 25 assessment for summer flounder (NEFSC 1997b), a slightly different comparison was made. The port agent interview data for 1991-93 and merged dealer/VTR data for 1994-1996 (the matched set data), which under each system serve as the Asample@ to characterize the total commercial landings, were compared in relative terms (percent frequency). For summer flounder, the percent frequency of short trips (lower number of days fished per trip) increased during 1991-1996, but not to the degree observed for cod, and the mode of CPUE rates for summer flounder increased in spite of lower effort per trip. For the summer flounder fishery, these may reflect actual changes in the fishery, due to increased restrictions on allowable landings per trip (trip landings limits might lead to shorter trips) and stock size increases (higher CPUE). As for cod, however, the influence of each of these changes (reporting system, management changes, stock size changes) has not been quantified. Total days fished in the summer flounder fishery were comparable between 1989-1993 period and 1994. Since 1994, total days fished have ranged from 20,700 days in 1999 to 9,300 days in 2004, with a mean of about 12,000 days, a substantial decline relative to the 1989-1993 mean of 22,000 days. Because the effort measure is critical to the estimation of discards for summer flounder, the VTR data were used as the best data source to estimate summer flounder fishery days fished for 1994-2006.

Two adjustments were made to the dealer/VTR matched data subset days fished estimates to fully account for summer flounder fishery effort during 1994-2006. First, the landings to days fished relationship in the matched set was assumed to be the same for unmatched trips, and so the days fished total in each discard estimation stratum (2-digit area and quarter) was raised by the dealer to matched set landings ratio. This step in the estimation accounted for days fished associated with trips landing summer flounder, and provided an estimate of discard for trips landing summer flounder. Given the restrictions on the fishery however, there is fishing activity which results in summer flounder discard, but no landings, especially in the scallop dredge fishery. The days fished associated with these trips was accounted for by raising strata discard estimates by the ratio of the total days fished on trips catching any summer flounder (trips with landings and discard, plus trips with discard only) to the days fished on trips landing summer flounder (trips with landings and discard), for VTR trips reporting discard of any species (DeLong *et al.* 1997). For this step, it is necessary to assume that the discard rate (as indicated by the fishery observer data, which includes trips with discard but no landings, and which is used in previous estimation procedure steps) is the same for trips with only discards as for trips with both landings and discards.

This “mean log ratio with correction” estimation procedure has been used in every assessment since 1993, including the 2006 update (Terceiro 2006). Discard estimates using this method for 1989-2006 are summarized in Table 1 (see ASSESS estimates). Discards as a proportion of the fishery observer data estimated landings were highest in 2001 (53%), and lowest in 1995 and 1996 (5 and 7%). Estimates of landings from observer data ranged from +53% (1999) to -70% (2001) of the reported landings in the fisheries, with discards ranging from 41% (1990) to 6% (1995) of the reported landings (Tables 1-2). Total discards estimated for 2003, 2004, and 2005 were 10%, 4%, and 4% of the reported landings. Scallop dredge fishery discard to landed ratios are much higher than trawl fishery ratios, purportedly because of closures and trip limits. Although the scallop dredge landings of summer flounder are less than 5% of the total, the discards of summer flounder have been estimated to be of the same order of magnitude as in the trawl fishery (see ASSESS estimates, Table 1).

## **Estimation of discards for groundfish: GARM 2007**

Rago et al. (2005) described methods recently adopted by the NEFSC to estimate the discards of trawl, gillnet, longline, scallop, and herring fisheries of the Northeast U.S. The Rago et al. (2005) work focused on the use of stratified discard to kept weight ratios (d/k) as the primary estimator, with the “d” portion for the stocks (or group of stocks) of interest, and the “k” portion most often for the kept of all species, or the species that comprised the dominant portion of the catch.

The method developed by Rago et al. (2005) was subsequently modified and used in an expanded exercise to develop discard estimates for 45 different fishing fleets and 60 fish stocks, encompassing all of the federally managed fisheries in the Northeast. This work is documented in Wigley et al. (2007) – the “SBRM Report.” Recently, these general methods were reviewed as part of the Groundfish Assessment Review Meeting (GARM) 2007 Data Methods Workshop. The working paper of Wigley et al. (MS2007) documents revisions to the Rago et al (2005) and Wigley et al. (2007) methods, and provides details on the methodology used to develop the National Bycatch Report for 2005, and proposes this method for use in the GARM 2008 assessments for New England groundfish. That general estimation method is used in this work, and is hereafter called the National Bycatch Report Discard method 2 (NBRD2).

The working paper of Legault (MS2007), also prepared for the GARM 2007 Data Methods Workshop, presented results of simulations designed to rank the utility of different methods to estimate commercial fishery discards. Among the methods compared were the approach currently used in the Terceiro (2006) summer flounder assessment (“mean log ratio with correction” in Legault MS2007) and the Wigley et al. (MS2007) NBRD2 approach (“ratio of sums” in Legault MS2007). Legault (MS2007) concluded that the “mean log ratio with correction” was not a good estimator for total discards, due to the potential for large bias in the estimates; the Wigley et al. (MS2007) “ratio of sums” was recommended as a good estimator, with use of “all species kept” appearing to produce less biased results than kept of only the species of interest. The Wigley et al. (MS2007) “ratio of sums” estimation method (NBRD2) has been used here to estimate discards and landings of summer flounder in the trawl, scallop dredge, and sink gillnet fisheries at different spatial and temporal stratifications, for comparison with estimates made in the Terceiro (2006) stock assessment using the “mean log ratio with correction” (ASSESS) method.

## **Comparative Results**

### *Trawl Fishery*

Discard estimation results for the current method (ASSESS) and the proposed NBRD2 method for trawl gear are compared in Table 1 and Figure 1. Discard estimates in Figure 1 are plotted with +/- one standard error (1 SE) bars. Over the 18 year (1989-2006) time series, the NBRD2 method provides higher discard estimates in 14 years. Of those 14 years, the +/- 1 SE error bars of the NBRD2 estimates overlap those of the ASSESS estimates in 7 years, suggesting that the estimates are comparable in those years – i.e., the two methods produce comparable estimates in 7 of the 18 total years. In 3 of those 7 years, the estimates match very closely (1997, 1999, 2002).

In general, the coefficient of variation (CV) for discard estimates are smaller for NBRD2 discard ratios calculated at a region/quarter stratification than at wider temporal scales (annual or

semi-annual), and at the quarterly time stratification are comparable to, but generally slightly higher than, the ASSESS discard rate CVs (Table 1, Figure 1). The ASSESS discard rate data are from “more directed” observed summer flounder trips (trips must have summer flounder discard and/or landings to be included) and so the discard rates tend to be less variable than the wider universe of trips used in the NBRD2 approach. In addition, the ASSESS method effort expansion factor (days fished) is from VTR trips reporting summer flounder discard and/or landings, which tend to be more “directed” in nature than the “all species landings” (i.e., all trips) expansion factor used in the NBRD2 method. These combined factors generally result in slightly better precision of the ASSESS discard estimates, in spite of the smaller number of observed trips used to calculate the discard rates.

The estimation of landings from the two methods can potentially be used a means to verify the accuracy of the discard estimates. Landings estimation results for the ASSESS and NBRD2 methods and DEALER reported landings for trawl gear are compared in Table 2 and Figure 2. The ASSESS method estimates of trawl landings are closer to the DEALER reported landings in 12 of the 18 years. There are time blocks (ASSESS: 1989-1997, 2001-2003; NBRD2: 1998-2000, 2004-2006) during which one method performs better than the other. Over the 1989-2006 period, DEALER reported landings averaged 4,853 mt, NBRD2 estimates averaged 5,914 mt (+22% above DEALER), and ASSESS estimates averaged 4,602 mt (-5%). The precision of the ASSESS method landings estimates is consistently better than for the NBRD2 method, due to the same factors as for the discards.

### *Scallop Dredge Fishery*

Discard estimation results for the current method (ASSESS) and the proposed NBRD2 method for trawl gear are compared in Table 1 and Figure 3. Discard estimates in the figure are plotted with +/- one standard error (1 SE) bars. Over the 15 year (1992-2006) time series, the NBRD2 method provides higher discard estimates in 12 years. Of those 12 years, the +/- 1 SE error bars of the NBRD2 estimates overlaps those of the ASSESS estimates in 4 years, suggesting that the estimates are comparable in those years – i.e., the two methods produce comparable estimates in 4 of the 15 total years. In 3 of those 4 years, the estimates match closely (1992, 1998, 2001).

In general, as with the trawl fishery estimates, the coefficient of variation (CV) for discard estimates are smaller for NBRD2 discard ratios calculated at the region/quarter stratification than at wider temporal scales (annual or semi-annual), and at the quarterly time stratification are comparable to the ASSESS discard rate CVs (Table 1, Figure 3). The ASSESS discard rate data are from more “directed” observed summer flounder trips (trips must have summer flounder discard and/or landings to be included) and so the discard rates tend to be less variable than the wider universe of trips used in the NBRD2 approach. In addition, the ASSESS method effort expansion factor (days fished) is from VTR trips reporting summer flounder discard and/or landings, which tend to be more “directed” (although still mainly bycatch in nature) than the “all scallop landings” (i.e., all scallop dredge trips) expansion factor used in the NBRD2 method. These combined factors generally result in slightly better precision of the ASSESS discard estimates, especially early in the time series when the total number of scallop dredge trips observed is small (< 50 trips annually).

The estimation of landings from the two methods can potentially be used a means to verify the accuracy of the discard estimates. Landings estimation results for the ASSESS and NBRD2 methods and DEALER reported landings for scallop dredge gear are compared in Table



2 and Figure 4. Summer flounder are generally a small bycatch in the scallop dredge fishery, and the DEALER reported landings have ranged from 25 to 284 mt over the series. The NBRD2 method estimates of summer flounder landings are closer to the DEALER reported landings in 12 of the 15 years. Over the 1992-2006 period, DEALER reported landings averaged 81 mt, NBRD2 estimates averaged 79 mt (-3%), and ASSESS estimates averaged 102 mt (+26%). The precision of the landings estimates are comparable for the two estimation methods over the time series.

### *Gillnet Fisheries*

Discard estimates for the gillnet fishery (sink, drift, and anchor combined) have not previously been estimated in the summer flounder assessment, due to the small magnitude of summer flounder landings in the DEALER reported data and the small absolute magnitude of summer flounder discards in the gillnet observer data. The Wigley et al (2007) report indicated, however, that in 2005 about 25 mt of summer flounder were discarded in the gillnet fisheries (mainly using extra large mesh and targeting monkfish), and so in this exercise discard estimates were made using the NBRD2 method (Table 1, Figure 5). Discard estimates in the Figure 5 are plotted with +/- one standard error (1 SE) bars. Over the 13 year (1994-2006) time series, the NBRD2 method provides discard estimates of 1 to 37 mt annually, with quarterly time strata CVs ranging from 59% (1994) to 18% (2005). The NBRD2 discard estimates for the gillnet fishery are relatively imprecise (CV > 30% in 9 of 13 years) because summer flounder are encountered relatively rarely in the gillnet fishery, and both the observer discard and landings rates are highly variable.

Landings estimation results for the NBRD2 method and DEALER reported landings for gillnet gear are compared in Table 2 and Figure 6. In the gillnet fishery, summer flounder generally are a small bycatch, and the DEALER reported landings have ranged from 8 to 143 mt over the series. NBRD2 method estimates of gillnet landings generally do not match the DEALER reported landings very well over the 13 years; DEALER reported landings averaged 67 mt, while NBRD2 estimates averaged 29 mt (-57%). NBRD2 landings estimates for quarterly time strata have CVs ranging from 78% (1997) to 19% (2004), exceeding 30% in 8 of the 13 years.

## **Summary**

This material was presented and discussed as part of a Post-GARM review session by the NEFSC Population Dynamic Branch (December 6, 2007). The results of that discussion are summarized as follows:

- GARM simulations suggested ASSESS method would prove to be positively biased...
- But, NBRD2 generally produced higher discard estimates for both trawl and scallop fisheries
- For trawl fishery NBRD2 discards average 900 mt; ASSESS discards average 500 mt
- ASSESS method precision was generally slightly better at region/quarter stratification
- ASSESS method estimates of trawl landings more consistently match DEALER over the 18 years (12 of 18 years); DEALER landings average 4,853 mt, NBRD2 estimates average 5,914 mt (+22%); ASSESS estimates average 4,602 mt (-5%)
- But, there are time blocks (ASSESS: 1989-1997, 2001-2003; NBRD2: 1998-2000, 2004-2006) during which one method performs better for the trawl fishery

- For scallop fishery NBRD2 discard estimates average 470 mt; ASSESS discards average 225 mt
- NBRD2 method estimates of scallop dredge landings more consistently match DEALER over the 15 years (12 of 15 years); DEALER landings average 81 mt, NBRD2 estimates average 79 mt (-3%); ASSESS estimates average 102 mt (+26%)
- For gillnet fishery NBRD2 discard estimates average 14 mt
- NBRD2 method estimates of gillnet landings generally don't match DEALER very well over the 13 years; DEALER averages 67 mt, NBRD2 averages 29 mt (-57%)
- The statistical diagnostics (i.e., CV indicating the precision of the discards and landings estimates) do not indicate that the NBRD2 approach represents an improvement over the current ASSESS method
- The verification method (i.e., matching the DEALER reported landings) do not indicate that the NBRD2 approach represents an improvement over the current method for trawl gear; the NBRD2 approach does seem to perform better than the current ASSESS approach for scallop dredge gear
- Given the lack of discard length frequency samples for summer flounder for gillnet gear, those discards may accounted for in the trawl fishery estimate by “raising” of the expansion factor
- Significantly more research into the sensitivity of the NBRD2 method to alternative stratification schemes is needed before the NBRD2 estimates are adopted in the assessment, and therefore...
- For now, make no changes to the discard estimation approach used in the assessment - update for 2008 benchmark assessment using the current ASSESS method
- For future work, focus on trawl and scallop dredge gear; try other approaches using sums of ratio (NBRD2) estimator, possibly with d/df for “directed” fluke trips (ASSESS) or for a “characteristic” group of landed species trips in the trawl fishery (e.g., fluke, scup, BSB, loligo, ilex, yellowtail flounder, winter flounder, cod, haddock, silver hake, etc.)

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Table 1: Comparison of summer flounder estimated discards using the NBRD2 method for alternative stratification of the discard rate. For trawl gear (negear = 050-059),  $d/k = d\_fluke/k\_allspecies$ ; for scallop dredge gear (negear = 132),  $d/k = d\_fluke/k\_scallop$ ; for gillnet (negear = 100,110,500),  $d/k = d\_fluke/k\_allspecies$ . N (number) of OB trips is the same for stratification levels within years. ASSESS row provides the discard estimates (based on geometric means of trip discard/days\_fished ratios) used in the current assessment; N OB trips are based on different criteria (required fluke catch) than current (NBRD2) method; no gillnet gear estimates made.

<b>1989</b>									
d/k strata	Trawl			Scallop			Gillnet		
	N OB trips	MT	CV(%)	N OB trips	MT	CV(%)	N OB trips	MT	CV(%)
Annual	176	881	36	0			0		
Semi		844	39						
Quarter		827	38						
ASSESS	57	642	33	n/a	n/a			n/a	
<b>1990</b>									
d/k strata	Trawl			Scallop			Gillnet		
	N OB trips	MT	CV(%)	N OB trips	MT	CV(%)	N OB trips	MT	CV(%)
Annual	138	1538	38	0			0		
Semi		1455	39						
Quarter		1603	38						
ASSESS	61	1121	32	n/a	n/a			n/a	
<b>1991</b>									
d/k strata	Trawl			Scallop			Gillnet		
	N OB trips	MT	CV(%)	N OB trips	MT	CV(%)	N OB trips	MT	CV(%)
Annual	256	308	47	0			0		
Semi		291	50						
Quarter		419	33						
ASSESS	82	993	31	n/a	n/a			n/a	

Table 1 continued.

<b>1992</b>									
d/k strata	N OB trips	Trawl		N OB trips	Scallop		N OB trips	Gillnet	
		MT	CV(%)		MT	CV(%)		MT	CV(%)
Annual	186	1747	34	18	156	272	0		
Semi		1766	35		159	239			
Quarter		1780	35		306	150			
ASSESS	66	517	33	8	237	62		n/a	
<b>1993</b>									
d/k strata	N OB trips	Trawl		N OB trips	Scallop		N OB trips	Gillnet	
		MT	CV(%)		MT	CV(%)		MT	CV(%)
Annual	66	1337	40	22	147	61	0		
Semi		1535	35		141	60			
Quarter		1604	34		141	59			
ASSESS	37	477	21	15	340	31		n/a	
<b>1994</b>									
d/k strata	N OB trips	Trawl		N OB trips	Scallop		N OB trips	Gillnet	
		MT	CV(%)		MT	CV(%)		MT	CV(%)
Annual	63	270	249	23	112	57	262	5	51
Semi		686	79		104	39		5	58
Quarter		756	72		107	38		5	59
ASSESS	51	429	36	14	591	30		n/a	
<b>1995</b>									
d/k strata	N OB trips	Trawl		N OB trips	Scallop		N OB trips	Gillnet	
		MT	CV(%)		MT	CV(%)		MT	CV(%)
Annual	225	534	21	27	445	42	552	11	63
Semi		514	22		437	43		17	40*
Quarter		500	23		800	14*		15	44*
ASSESS	134	130	17	19	212	27		n/a	

Table 1 continued.

<b>1996</b>									
d/k strata	N OB trips	Trawl		N OB trips	Scallop		N OB trips	Gillnet	
		MT	CV(%)		MT	CV(%)		MT	CV(%)
Annual	194	330	72	40	401	34	450	1	33
Semi		411	57		433	31		1	34
Quarter		630	35		442	26		1	34
ASSESS	111	319	18	24	135	12		n/a	
<b>1997</b>									
d/k strata	N OB trips	Trawl		N OB trips	Scallop		N OB trips	Gillnet	
		MT	CV(%)		MT	CV(%)		MT	CV(%)
Annual	112	126	89	29	654	25	403	2	23
Semi		153	73		556	28		2	23
Quarter		276	29		433	12		2	25
ASSESS	59	299	24	23	108	24		n/a	
<b>1998</b>									
d/k strata	N OB trips	Trawl		N OB trips	Scallop		N OB trips	Gillnet	
		MT	CV(%)		MT	CV(%)		MT	CV(%)
Annual	70	293	70	26	223	33	447	5	40
Semi		437	36		207	33		5	42
Quarter		638	27		191	13		5	43
ASSESS	53	318	18	22	169	27		n/a	
<b>1999</b>									
d/k strata	N OB trips	Trawl		N OB trips	Scallop		N OB trips	Gillnet	
		MT	CV(%)		MT	CV(%)		MT	CV(%)
Annual	108	872	70	31	194	106	222	7	45
Semi		672	89		224	88		7	42
Quarter		1462	34		205	95		7	42
ASSESS	56	1476	33	10	459	39		n/a	

Table 1 continued.

<b>2000</b>									
d/k strata	N OB trips	Trawl		N OB trips	Scallop		N OB trips	Gillnet	
		MT	CV(%)		MT	CV(%)		MT	CV(%)
Annual	187	304	32	261	745	51	255	5	33
Semi		342	29		745	52		5	34
Quarter		459	21		780	38		4	36
ASSESS	115	740	21	23	167	19		n/a	
<b>2001</b>									
d/k strata	N OB trips	Trawl		N OB trips	Scallop		N OB trips	Gillnet	
		MT	CV(%)		MT	CV(%)		MT	CV(%)
Annual	282	1016	42	106	360	13	197	8	35
Semi		911	46		357	13		13	28
Quarter		971	44		358	12		14	27
ASSESS	137	287	35	68	297	12		n/a	
<b>2002</b>									
d/k strata	N OB trips	Trawl		N OB trips	Scallop		N OB trips	Gillnet	
		MT	CV(%)		MT	CV(%)		MT	CV(%)
Annual	325	379	25	94	536	20	150	29	72
Semi		407	20		550	19		33	63
Quarter		418	19		547	16		37	56
ASSESS	175	384	21	55	178	25		n/a	
<b>2003</b>									
d/k strata	N OB trips	Trawl		N OB trips	Scallop		N OB trips	Gillnet	
		MT	CV(%)		MT	CV(%)		MT	CV(%)
Annual	533	364	37	122	650	25	516	22	30
Semi		709	26		608	25		22	30
Quarter		697	21		619	22		20	32
ASSESS	212	556	19	79	194	14		n/a	

Table 1 continued.

<b>2004</b>									
d/k strata	Trawl			Scallop			Gillnet		
	N OB trips	MT	CV(%)	N OB trips	MT	CV(%)	N OB trips	MT	CV(%)
Annual	952	801	17	249	814	15	1058	31	26
Semi		841	16		844	14		33	22
Quarter		867	15		824	12		30	24
ASSESS	546	213	18	132	92	11		n/a	
<b>2005</b>									
d/k strata	Trawl			Scallop			Gillnet		
	N OB trips	MT	CV(%)	N OB trips	MT	CV(%)	N OB trips	MT	CV(%)
Annual	1736	996	9	290	515	13	940	25	18
Semi		1061	9		554	12		27	17
Quarter		1080	8		551	12		24	18
ASSESS	906	191	16	136	96	13		n/a	
<b>2006</b>									
d/k strata	Trawl			Scallop			Gillnet		
	N OB trips	MT	CV(%)	N OB trips	MT	CV(%)	N OB trips	MT	CV(%)
Annual	873	937	15	207	753	15	234	20	52
Semi		982	14		752	15		19	53
Quarter		1154	12		713	15		22	43*
ASSESS	578	268	3	117	93	3		n/a	

\*NOTE THAT USE OF IMPUTED CELLS OFTEN REDUCES VARIANCE

Table 2. Comparison of summer flounder estimated landings using the NBRD2 method for alternative stratification of the landings rate. For trawl gear (negear = 050-059),  $k/k = k_{\text{fluke}}/k_{\text{allspecies}}$ ; for scallop dredge gear (negear = 132),  $k/k = k_{\text{fluke}}/k_{\text{scallop}}$ ; for gillnet (negear = 100,110,500),  $k/k = k_{\text{fluke}}/k_{\text{allspecies}}$ . N (number) of OB trips is the same for stratification levels within years. ASSESS row provides the landings estimates (based on geometric means of trip landings/days\_fished ratios) used in the current assessment; no comprehensive CVs available; N OB trips are based on different criteria (required fluke catch) than current (NBRD2) method; no gillnet gear estimates made. DEALER row provides the reported dealer landings by gear.

<b>1989</b>									
d/k strata	N OB trips	Trawl		N OB trips	Scallop		N OB trips	Gillnet	
		MT	CV(%)		MT	CV(%)		MT	CV(%)
Annual	176	9494	33	0			0		
Semi		7913	40						
Quarter		7992	36						
ASSESS	57	7255	22	n/a			n/a		
DEALER		6003			108			8	
<b>1990</b>									
d/k strata	N OB trips	Trawl		N OB trips	Scallop		N OB trips	Gillnet	
		MT	CV(%)		MT	CV(%)		MT	CV(%)
Annual	138	4768	38	0			0		
Semi		5573	37						
Quarter		4454	42						
ASSESS	61	2959	21	n/a			n/a		
DEALER		2798			89			5	
<b>1991</b>									
d/k strata	N OB trips	Trawl		N OB trips	Scallop		N OB trips	Gillnet	
		MT	CV(%)		MT	CV(%)		MT	CV(%)
Annual	256	1638	30	0			0		
Semi		1541	33						
Quarter		1887	24						
ASSESS	82	4133	13	n/a			n/a		
DEALER		4344			176			16	



Table 2 continued.

<b>1992</b>									
d/k strata	N OB trips	Trawl		N OB trips	Scallop		N OB trips	Gillnet	
		MT	CV(%)		MT	CV(%)		MT	CV(%)
Annual	186	10364	33	18	196	168	0		
Semi		10317	34		203	152			
Quarter		11532	34		364	65			
ASSESS DEALER	66	4532 5943	12	8	811 284	28		n/a 18	
<b>1993</b>									
d/k strata	N OB trips	Trawl		N OB trips	Scallop		N OB trips	Gillnet	
		MT	CV(%)		MT	CV(%)		MT	CV(%)
Annual	66	10494	37	22	117	68	0		
Semi		10028	38		114	70			
Quarter		10946	33		129	64			
ASSESS DEALER	37	3823 4176	20	15	209 140	38		8	
<b>1994</b>									
d/k strata	N OB trips	Trawl		N OB trips	Scallop		N OB trips	Gillnet	
		MT	CV(%)		MT	CV(%)		MT	CV(%)
Annual	63	5750	56	23	16	141	262	9	78
Semi		6839	45		19	221		11	62
Quarter		5971	48		23	86		11	62
ASSESS DEALER	51	5858 4240	15	14	145 178	61		n/a 16	
<b>1995</b>									
d/k strata	N OB trips	Trawl		N OB trips	Scallop		N OB trips	Gillnet	
		MT	CV(%)		MT	CV(%)		MT	CV(%)
Annual	225	15253	16	27	97	65	552	5	37
Semi		14413	17		92	70		5	37
Quarter		13000	19		126	45*		5	37
ASSESS DEALER	134	5855 4507	10	19	36 92	59		n/a 13	

Table 2 continued.

<b>1996</b>									
d/k strata	N OB trips	Trawl		N OB trips	Scallop		N OB trips	Gillnet	
		MT	CV(%)		MT	CV(%)		MT	CV(%)
Annual	194	2831	141	40	48	57	450	2	25
Semi		3932	94		54	54		2	24
Quarter		7851	41		48	59		2	24
ASSESS	111	4982	32	24	42	55		n/a	
DEALER		3718			42			12	
<b>1997</b>									
d/k strata	N OB trips	Trawl		N OB trips	Scallop		N OB trips	Gillnet	
		MT	CV(%)		MT	CV(%)		MT	CV(%)
Annual	112	274	128	29	21	59	403	72	95
Semi		511	71		29	33		77	92
Quarter		950	41		29	33		95	78
ASSESS	59	2646	34	23	17	35		n/a	
DEALER		3657			25			63	
<b>1998</b>									
d/k strata	N OB trips	Trawl		N OB trips	Scallop		N OB trips	Gillnet	
		MT	CV(%)		MT	CV(%)		MT	CV(%)
Annual	70	1704	78	26	82	43	447	4	32
Semi		3209	49		87	45		4	30
Quarter		4810	28		88	42		4	30
ASSESS	53	3602	23	22	75	32		n/a	
DEALER		4585			52			89	
<b>1999</b>									
d/k strata	N OB trips	Trawl		N OB trips	Scallop		N OB trips	Gillnet	
		MT	CV(%)		MT	CV(%)		MT	CV(%)
Annual	108	1693	97	31	42	96	222	23	68
Semi		1143	114		47	76		27	58
Quarter		4307	38		67	33		27	58
ASSESS	56	7214	24	10	182	52		n/a	
DEALER		4429			71			50	

Table 2 continued.

<b>2000</b>									
d/k strata	N OB trips	Trawl		N OB trips	Scallop		N OB trips	Gillnet	
		MT	CV(%)		MT	CV(%)		MT	CV(%)
Annual	187	1589	116	261	34	118	255	42	63
Semi		1682	115		26	109		42	63
Quarter		7558	16		34	86		57	57
ASSESS	115	6668	18	23	34	50		n/a	
DEALER		4625			25			52	
<b>2001</b>									
d/k strata	N OB trips	Trawl		N OB trips	Scallop		N OB trips	Gillnet	
		MT	CV(%)		MT	CV(%)		MT	CV(%)
Annual	282	580	38	106	10	38	197	25	39
Semi		840	31		10	39		24	40
Quarter		912	30		10	37		21	47
ASSESS	137	1509	28	68	3	123		n/a	
DEALER		4512			44			79	
<b>2002</b>									
d/k strata	N OB trips	Trawl		N OB trips	Scallop		N OB trips	Gillnet	
		MT	CV(%)		MT	CV(%)		MT	CV(%)
Annual	325	5115	30	94	14	36	150	16	43
Semi		5997	25		15	34		14	51
Quarter		5201	29		14	33		14	49
ASSESS	175	6609	18	55	4	58		n/a	
DEALER		6054			36			102	
<b>2003</b>									
d/k strata	N OB trips	Trawl		N OB trips	Scallop		N OB trips	Gillnet	
		MT	CV(%)		MT	CV(%)		MT	CV(%)
Annual	533	1318	132	122	33	36	516	69	25
Semi		5500	40		35	35		61	26
Quarter		6223	41		39	28		58	26
ASSESS	212	5990	17	79	8	35		n/a	
DEALER		5935			44			116	

Table 2 continued.

<b>2004</b>									
d/k strata	N OB trips	Trawl		N OB trips	Scallop		N OB trips	Gillnet	
		MT	CV(%)		MT	CV(%)		MT	CV(%)
Annual	952	4202	17	249	66	29	1058	36	20
Semi		5243	18		75	26		39	18
Quarter		5270	16		65	28		38	19
ASSESS DEALER	546	4992 6950	10	132	5 42	47		n/a 109	
<b>2005</b>									
d/k strata	N OB trips	Trawl		N OB trips	Scallop		N OB trips	Gillnet	
		MT	CV(%)		MT	CV(%)		MT	CV(%)
Annual	1736	4213	16	290	51	29	940	20	34
Semi		4178	17		49	30		21	32
Quarter		4530	14		45	30		22	30
ASSESS DEALER	906	3425 5793	9	136	9 55	29		n/a 143	
<b>2006</b>									
d/k strata	N OB trips	Trawl		N OB trips	Scallop		N OB trips	Gillnet	
		MT	CV(%)		MT	CV(%)		MT	CV(%)
Annual	873	1363	40	207	131	25	234	16	53
Semi		1383	40		107	25		14	57
Quarter		3057	23		102	25		17	43
ASSESS DEALER	578	1787 5066	2	117	9 86	16		n/a 41	

\*NOTE THAT USE OF IMPUTED CELLS OFTEN REDUCES VARIANCE

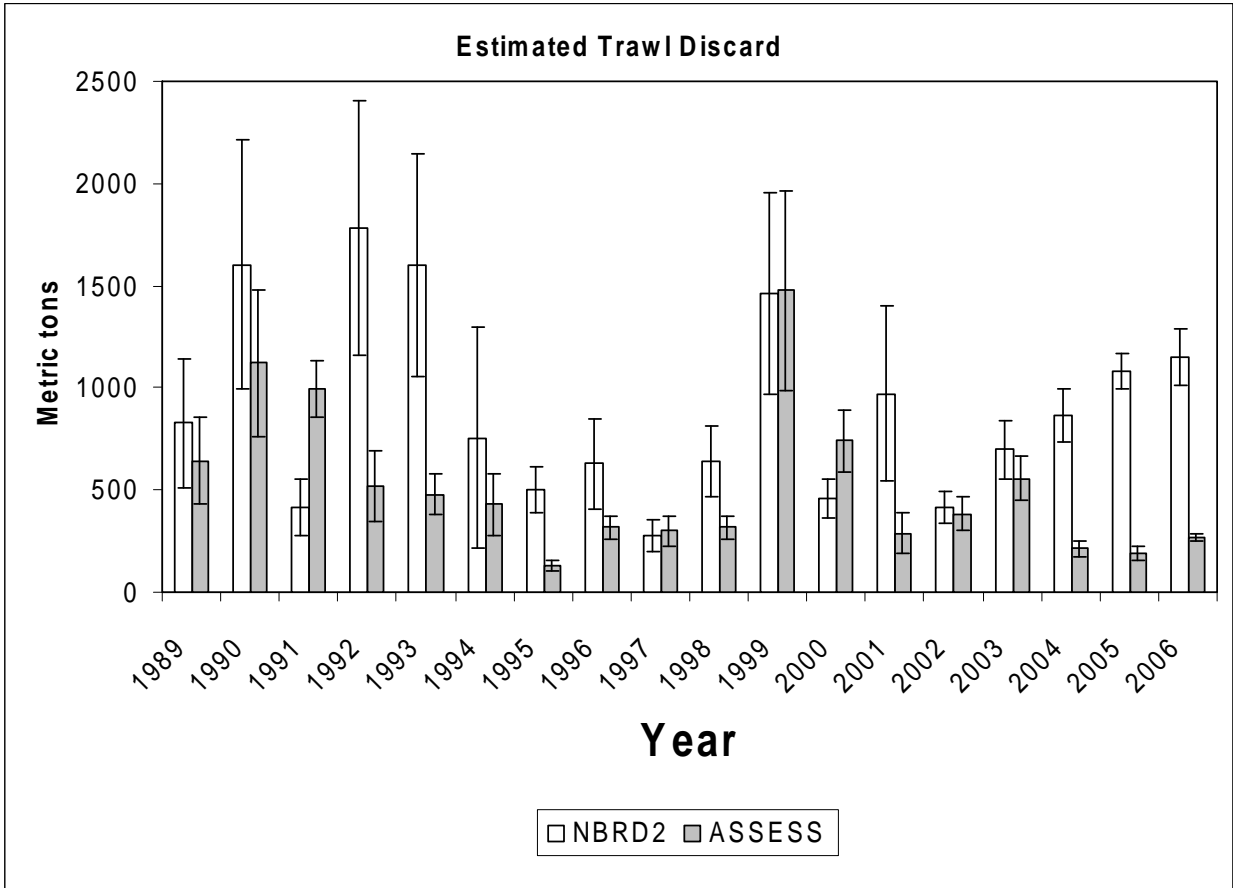


Figure 1.

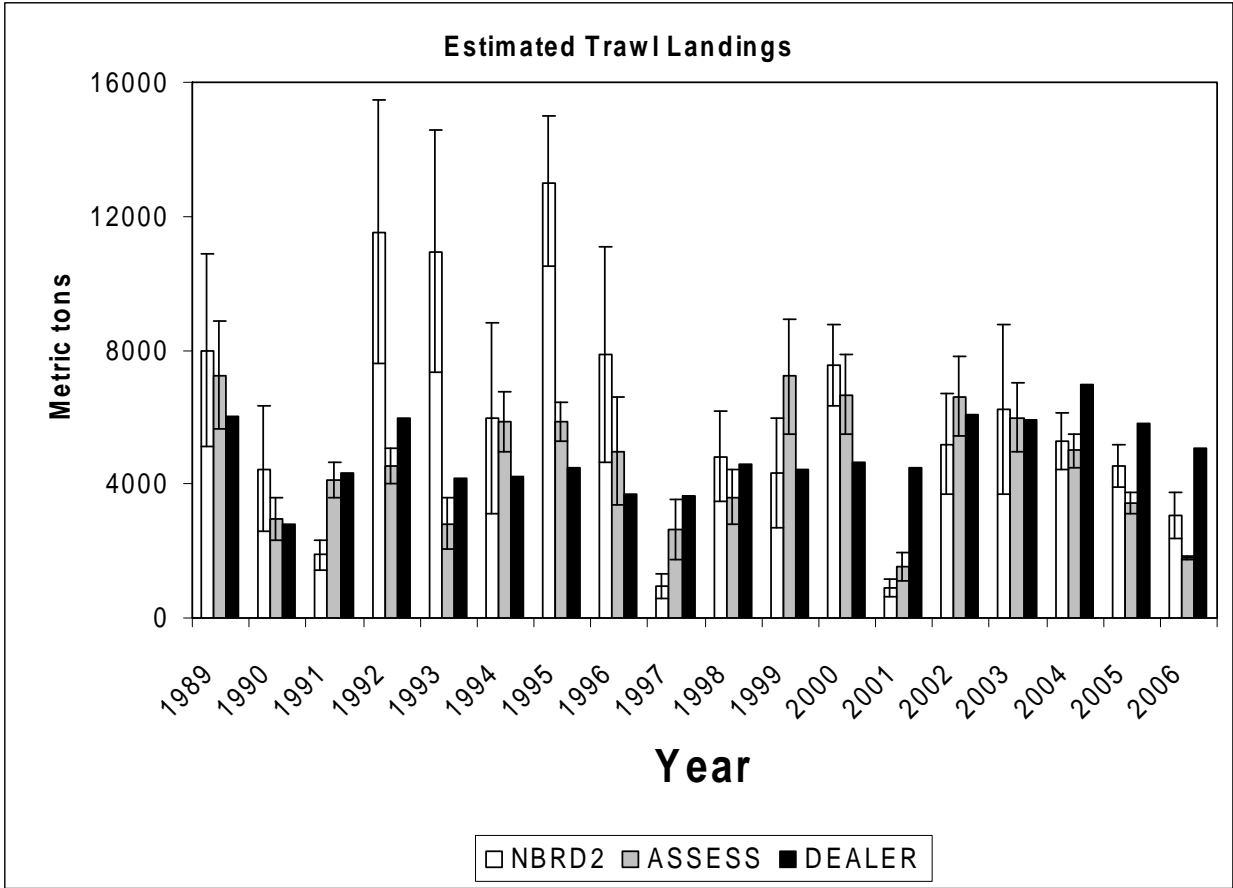


Figure 2.

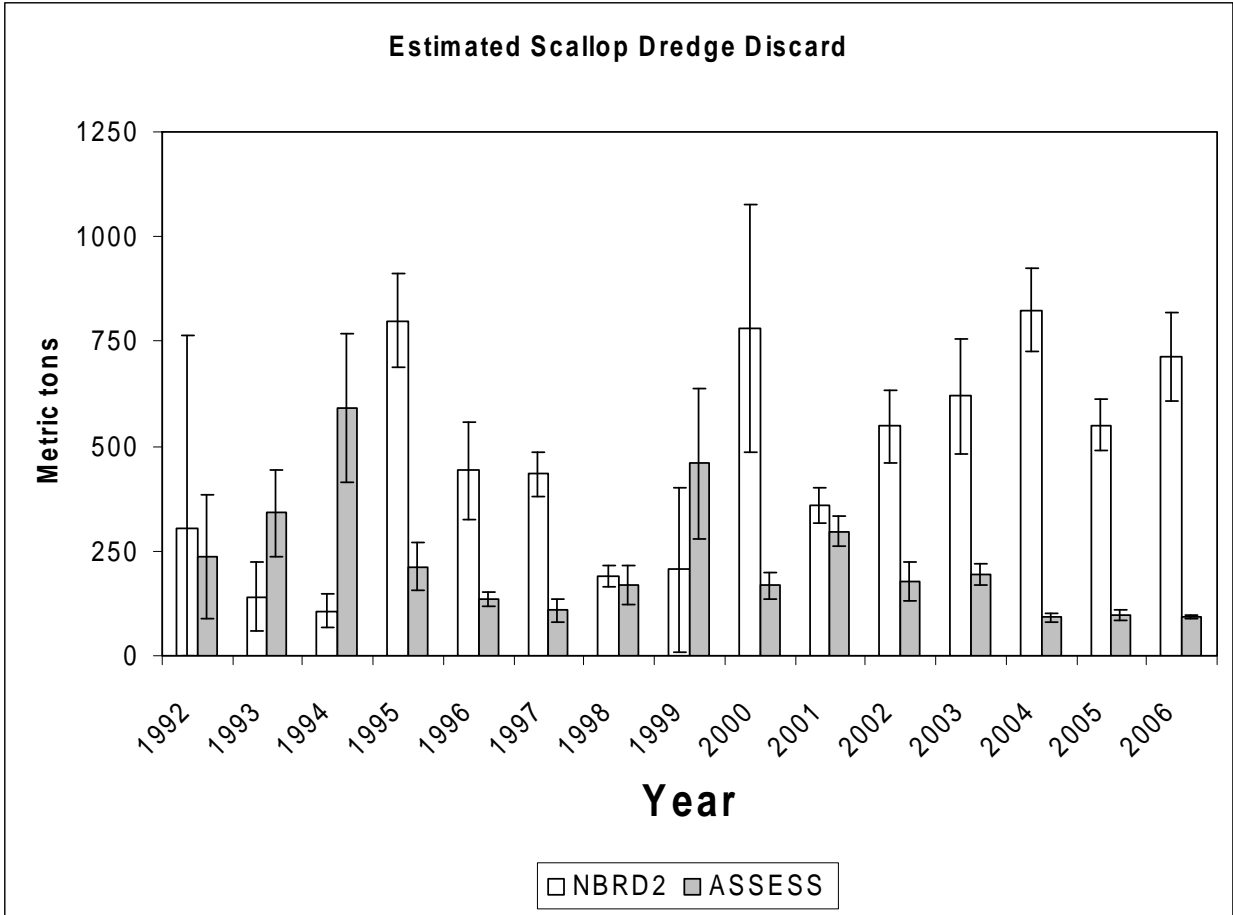


Figure 3.

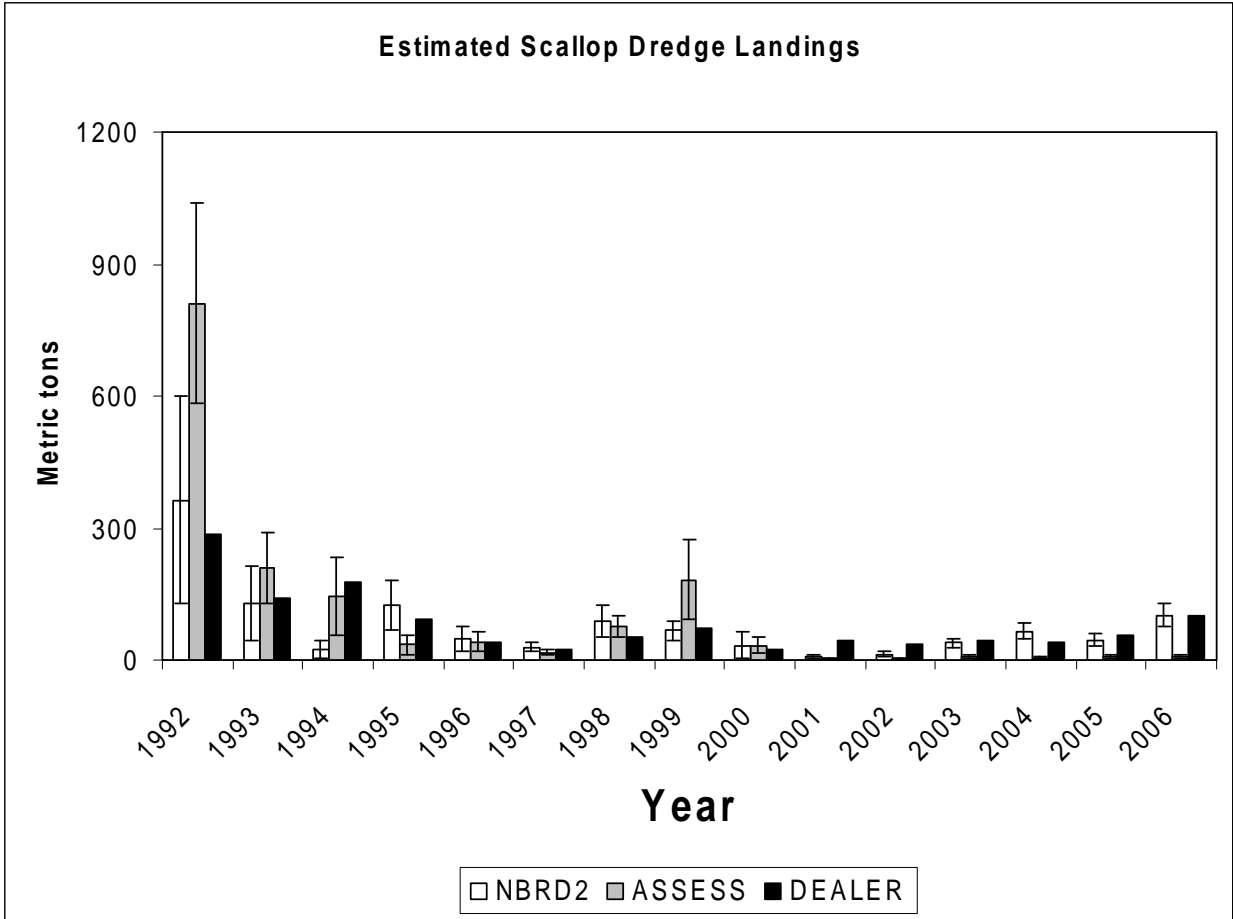


Figure 4.



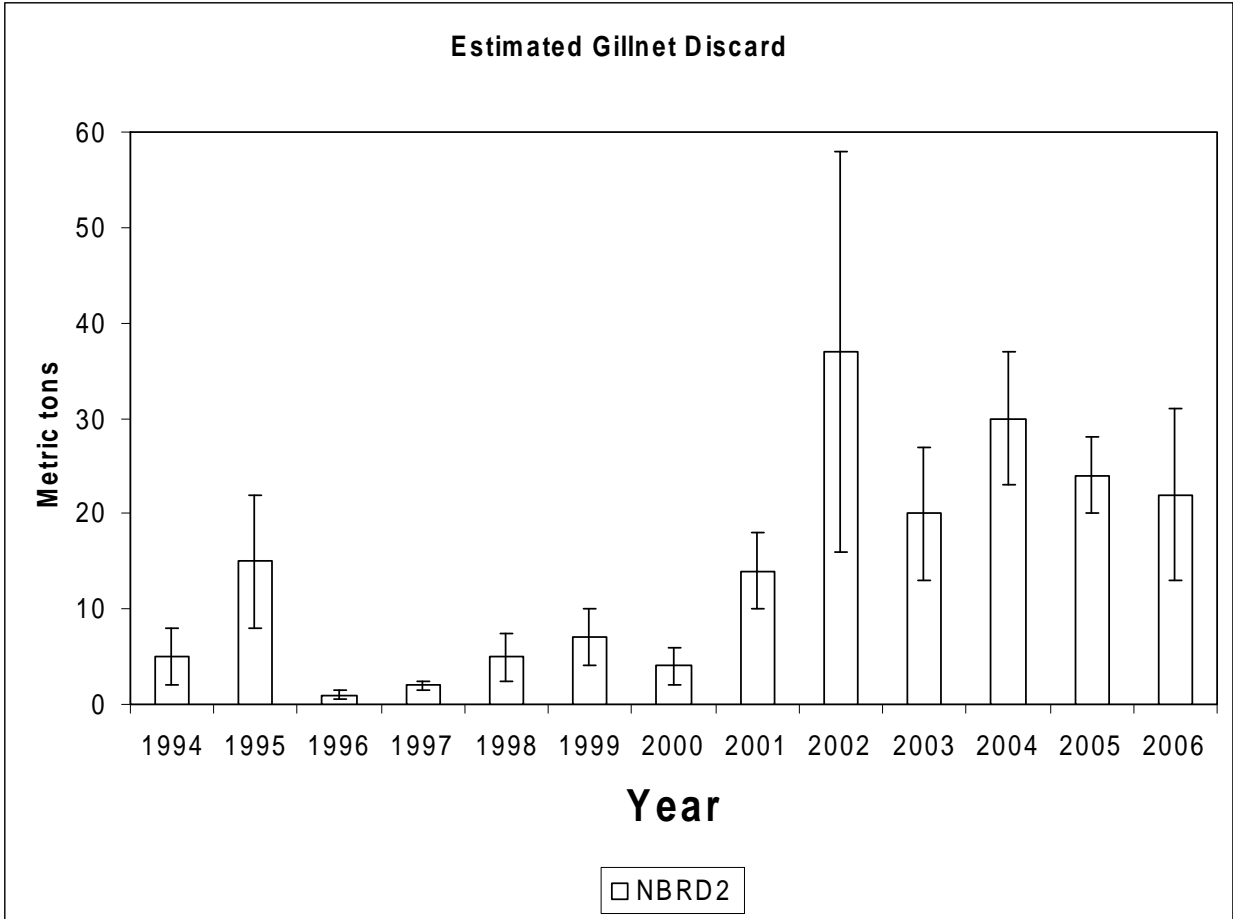


Figure 5

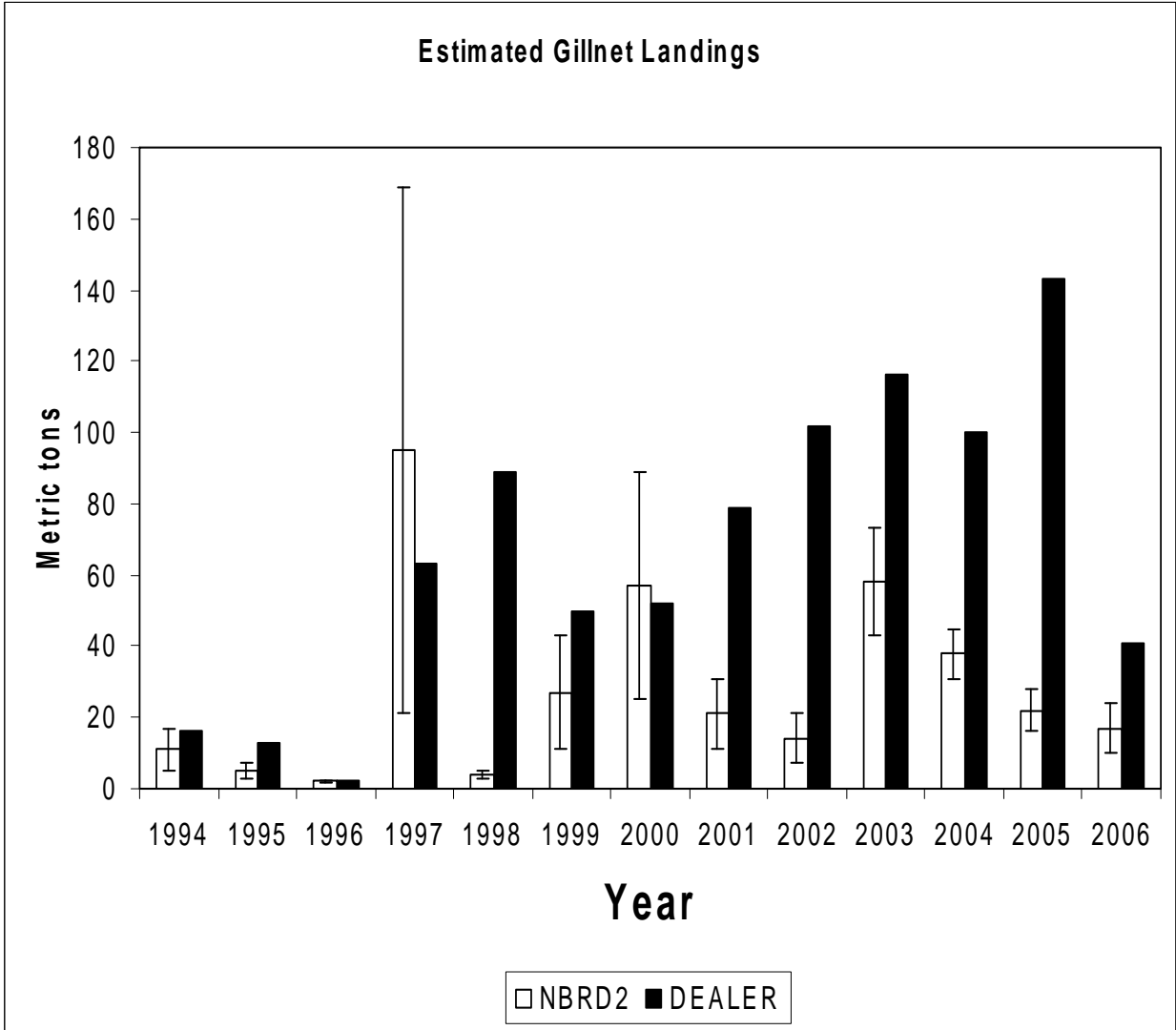


Figure 6.

## SAW 47 Working Paper 2 (TOR 1) – Commercial Discard Mortality

WORKING PAPER:

### DISCARD MORTALITY OF SUMMER FLOUNDER IN THE INSHORE TRAWL FISHERY

Emerson Hasbrouck  
Tara Froehlich  
Kristin Gerbino  
John Scotti  
*Marine Program*

*Cornell University Cooperative Extension*

Eric N. Powell  
Eleanor Bochenek  
Jason Morson

*Haskin Shellfish Research Laboratory  
Rutgers University*

### SUMMARY

In 2007, Cornell University Cooperative Extension received a RSA grant to determine the discard mortality in the inshore summer flounder trawl fishery. Fieldwork was carried out successfully from May through October 2007 off Long Island, New York. Ten scientific trips were made on commercial draggers working the traditional mixed trawl fishery. A goal of the project was to determine discard mortality relative to tow duration, fish size, and the amount of time fish were on the deck of the vessel. Tows of 1, 2 and 3 hours in duration were conducted. Fish were culled both immediately (from 0-10 minutes on deck) and after being held on deck for a delayed period of time (25-35 minutes on deck). Approximately 20 live fish were removed from the immediate and delayed culls upon haul-back of each tow. These live fish were weighed, tagged, and graded by condition before being transferred to a flow through seawater holding system where they were held on deck for the duration of the trip. The total catch of fluke was weighed and sorted between live and dead at consistent intervals of time to determine the effect of culling for as long as it took to clear the deck. Other variables were examined including total catch weight, species composition of total catch, fish condition factors, gear size, water temperature and air temperature. Upon arrival at the dock, live fish were transferred to a dockside net pen holding system and monitored for mortality over a 14-day period. Discard mortality rates were calculated based on the live/dead fraction of fish sorted on deck as well as the mortality rate of the live fish held in the monitoring net pen system over a 14 day period. Mortality rates were calculated by tow duration, cull time and overall. Mortality rates for the one and two hour tows were less than for the three hour tow. Mortality rates for the immediate cull

and delayed cull were similar. Overall median mortality was similar to the value assumed in recent summer flounder assessments.

## METHODS

The research design of this study was dictated by the specific proposal requirements, i.e. to conduct ten one-day fishing trips incorporating different gear types, and areas fished, reflective of the inshore mixed trawl fishery. The selection of gear, fishing area, target species was left to the participating commercial fisherman to determine in consultation with CCE. This was done with the hope of not skewing the results in any one given direction, by letting the natural conditions dictate the project activity to reflect a more realistic picture of the existing inshore trawl fishery including summer flounder. Ten research trips were completed and have met the design criteria outlined in the proposal. Each trip consisted of a one, two and three hour tow, with an immediate and delayed cull for each specific tow. A specific culling procedure was adopted, so as to maintain random sampling protocol. The following time line was used after haul back:

- 0-10 minutes (immediate cull) – collection of 20 live fish for cages plus sorting of live and dead fish from one half of the pile.
- 10-25 minutes – sorting of live and dead fish only.
- 25-35 minutes (delayed cull) – collection of 20 live fish for cages plus sorting of live and dead fish from second half of the pile.
- 35-50 minutes – sorting of live and dead fish only.

Processing the catch continued until all summer flounder were sorted by live or dead in 15 minute increments of time until all fish were sorted. In addition, all other species in each tow were recorded. For each of the three tows conducted, forty live fish randomly selected were tagged, weighed, measured and rated as to condition utilizing a scale of excellent, good, poor with specific trawl damage noted.

The live fish selected for the mortality monitoring component of the project were held during the trip in an on board holding system. Twenty live fish were selected from each cull time for each tow duration. 120 total live fish were held for each trip. The on board holding system and plan adopted was similar to that used in the commercial fishery for holding and transport of live fish. Two 35 cubic foot, 268 gallon capacity Bonar insulated holding containers were used in addition to 22 holding cages constructed of plastic coated wire. The live fish were placed in the cages, and the cages were stacked in the Bonar containers filled with seawater. Each Bonar container held up to eight cages, with each cage typically holding ten fish. This system allowed for optimum holding and transport of the fish. The cages kept the fish from sloshing in the containers, kept the weight of fish off of each other and allowed for maximum water flow around each individual fish.

Two (2) twelve volt battery operated aerator compressor systems utilizing four large capacity air stones per container were used to aerate the holding system. This method has proven to be very effective in terms of maintaining fish condition and was very practical for fish handling purposes. The on board holding system was continually monitored for water temperature and dissolved oxygen levels during each trip. Surface and bottom temperatures and dissolved oxygen were also monitored in the targeted fishing areas and correlated with the temperatures and oxygen levels in the on board holding system.

The ability to safely hold and monitor all study fish was necessary to fully measure summer flounder trawl discard mortality. Through consultation with aquaculture specialists, commercial fishermen and gear specialist we were able to design, construct and install a 15' diameter by 15' deep pentagon shaped net pen attached to a stake system incorporating a pulley rope system which allowed the raising and lowering of the net pen similar to a pound net installation. This design allowed easy access to stock and the ability to monitor and finally release study fish with minimum impact. The net pen was installed next to the Inlet Seafood Dock at Montauk. The location was adjacent to the Montauk Harbor Inlet and provided excellent water quality and good flushing and exchange with Block Island Sound.

At the end of each of the scheduled discard mortality harvest trips all fish held live in the on-board live holding system from each tow and cull, were transferred to the dockside net pen holding system. They were held in the net pen system for 14 days to monitor mortality. Scuba certified staff conducted net pen monitoring on days 1, 2, 3 and then every other day during the 14 day holding period. Information collected included dead fish vitals, fish tag numbers, surface and bottom water temperature/ DO levels. Scales and otoliths were also collected from dead fish.

On day 14 the net pen was lifted and all remaining fish including live fish, dead fish and control fish, were removed from the net pen. Tag information and fish condition index were recorded for all fish. All live control and experimental fish were released in adjacent waters. The net pen was then re-set and prepared to receive a new set of control fish as well as the new set of experimental fish being harvested on board the mortality harvest trip. We utilized two CCE crews on each day that we had a scheduled harvest trip (every 14 days). One crew went out on the trawler and performed all scientific components associated with the collection and harvest of fish. The other crew was the net pen shore side crew and took care of all scientific components related to: collecting and releasing fish from the net pen after their 14 day study; accepting and processing new control fish; transferring the new set of experimental fish into the net pen when the harvest vessel and crew returned to the dock at the end of the day. This two crew procedure provided for efficiency of the overall process and allowed us to stick to a schedule of a new harvest trip every 14 days in order to accomplish the number of trips needed before the end of October. Also, local baymen were hired to lift and re-set the net pen on each release day.

## RESULTS

We calculated the cumulative mortality for each tow on trips 3-10 using the mortality on board and estimating the number of live fish culled that would have died using the 14-day survivorship observed in the dockside holding/monitoring pen. First, for each trip, tow, and cull time we calculated a weight for dead fish in the pen that was corrected for the mortality rate of control fish in the pen,  $\hat{w}t_d$ :

$$\hat{w}t_d = w_d - [(1 - surv_c)(w_d + w_l)] \quad (1)$$

where  $w_d$  is the weight of dead fish in the pen,  $surv_c$  is the fraction of control fish living after 14 days in the pen, and  $w_l$  is the weight of live fish released from the pen after 14 days.

The survivorship of live fish in the pen, SP, was determined as:

$$SP = wt_i / (wt_i + \hat{w} t_d) \quad (2)$$

The survivorships from equation (2) were used to calculate the ratio of survivorship between the immediate and delayed cull times,  $\Delta S$ :

$$\Delta S = SP_{\tau=D} / SP_{\tau=I} \quad (3)$$

where  $SP_{\tau=D}$  is the survivorship of fish in the pen at the delayed cull time and  $SP_{\tau=I}$  is the survivorship of fish in the pen at immediate cull time.

We calculated the elapsed time between the immediate and delayed cull times,  $t$  as:

$$t = [(t_e - t_s)/2 + t_s]_{\tau=D} - [(t_e - t_s)/2 + t_s]_{\tau=I} \quad (4)$$

where  $t_e$  is the end of the time interval in question, from the time the net was brought onboard, and  $t_s$  is the start of the time interval in question, both in cumulative minutes.

The change in the survival fraction,  $\Delta S$ , between the two cull times is converted to a rate,  $fm$ , that can be used to estimate the change from any other cull time, under the assumption that the rate is linear with time:

$$fm = (-\ln(\Delta S)) / t \quad (5)$$

Thus, to calculate the amount of surviving summer flounder, we apply this rate to each 10-15 minute cull period, using equation (4) to determine the elapsed time. Then, the estimated fish surviving,  $EL$ , is:

$$EL = \sum_{i=1}^n (L_{up} + L_p) e^{-fm \times t} \quad (6)$$

where  $L_{up}$  is the weight of live fish that were not placed into the pen and  $L_p$  is the weight of the live fish that were placed into the pen.

The estimated weight of dead fish for each tow,  $ED$ , is then:

$$ED = wt_c - EL \quad (7)$$

where  $wt_c$  is the total catch weight for all summer flounder.

Finally, the % mortality for the tow can be calculated as:

$$\% Mortality = ED / (ED + EL) \quad (8)$$

The discard mortality for each tow length duration, as well as for all tow durations combined, is shown in Table 1. These mortality rates are for the entire summer flounder catch for each tow duration and reflect the total mortality for each tow from the time the fish were dumped on deck until the deck is cleared. The median mortality for all tows combined at 78.7% is very close to the estimated overall discard mortality of 80% currently used in the summer flounder assessment. The mean of 64.6% however is considerably less. Also the mean and median mortality rates for the one hour and two hour tows are considerably less than the currently estimated 80% mortality. In order to use a mortality rate representative of the overall inshore fishery for summer flounder, tow length parameters of the fishery should be evaluated. Observer data and VTR data should be analyzed for average tow time across the fishery. Our calculated mortality rate for the tow duration that is most representative of the Observer/VTR data could then be used in the assessment.

An *a posteriori* least squares means test on tow time shows that mortality was greater in 3-hour tows than 2-hour tows and greater in 2-hour tows than 1-hour tows. Additionally, 1-hour tows and 3-hour tows were significantly different from each other ( $p = .0044$ ).

The calculated mortality by tow duration and cull time is shown in Table 2. All of these values are considerably different, for both the mean and median, from the currently used 80% rate and exhibit a considerable range. Interestingly there is not much difference between the overall mortality rate for all tows combined at the immediate cull and at the delayed cull.

Table 1. Mean, standard deviation in parentheses, median, 25<sup>th</sup> to 75<sup>th</sup> percentiles for the percent mortality by tow time and overall.

<b>% MORTALITY</b>	<b>MEAN</b>	<b>MEDIAN</b>	<b>25<sup>TH</sup>-75<sup>TH</sup> PERCENTILE</b>
<b>TOW 1</b>	<b>57.8(35.5)</b>	<b>63.9</b>	<b>27.7-96.0</b>
<b>TOW 2</b>	<b>61.4(31.4)</b>	<b>63.3</b>	<b>32.7-89.1</b>
<b>TOW 3</b>	<b>76.6(29.5)</b>	<b>86.9</b>	<b>60.0-98.0</b>
<b>ALL</b>	<b>64.6(32.2)</b>	<b>78.7</b>	<b>31.0-96.0</b>

Table 2. Mean, standard deviation in parentheses, median, 25<sup>th</sup> to 75<sup>th</sup> percentiles for the percent mortality by tow time, cull time, and overall. I=initial cull. D=delayed cull.

<b>% MORTALITY</b>	<b>MEAN</b>	<b>MEDIAN</b>	<b>25<sup>TH</sup>-75<sup>TH</sup> PERCENTILE</b>
<b>TOW 1 I</b>	<b>44.9(39.2)</b>	<b>34.6</b>	<b>9.0-96.0</b>
<b>TOW 1 D</b>	<b>44.3(41.7)</b>	<b>31.8</b>	<b>1.6-87.3</b>
<b>TOW 2 I</b>	<b>47.8(36.1)</b>	<b>48.5</b>	<b>11.2-78.4</b>
<b>TOW 2 D</b>	<b>68.4(28.9)</b>	<b>68.5</b>	<b>43.2-97.8</b>
<b>TOW 3 I</b>	<b>62.7(36.7)</b>	<b>68.8</b>	<b>32.1-97.0</b>
<b>TOW 3 D</b>	<b>68.5(27.7)</b>	<b>63.8</b>	<b>45.6-97.4</b>
<b>ALL I</b>	<b>51.3(36.8)</b>	<b>50.1</b>	<b>12.5-96.0</b>
<b>ALL D</b>	<b>59.2(34.9)</b>	<b>59.4</b>	<b>32.6-95.6</b>



## APPENDIX 2

### SAW 47 Working Paper 3 (TOR 2a) – Integrating Indices

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#### **Some approaches to the integration of survey abundance indices used in VPA calibration**

by

Mark Terceiro  
NOAA Fisheries NEFSC  
166 Water Street  
Woods Hole, MA 02563  
1-508-495-2203 (Phone)  
1-508-495-2393 (Fax)  
[Mark.Terceiro@noaa.gov](mailto:Mark.Terceiro@noaa.gov)

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#### **ABSTRACT**

Northeast United States fish stock assessments typically incorporate multiple abundance indices at age from several state and federal research survey programs. Peer reviews of these assessments have recommended investigation of methods to better integrate trends in abundance provided by survey indices, prior to their use in population model calibration. Exercises were performed to explore different approaches to the integration of survey indices for use in virtual population analysis calibration. General linear modeling of integrated indices of abundance provides a useful summarization of mean survey trends. However, an empirical example for summer flounder shows that the use of integrated indices as input to virtual population analysis calibration does not guarantee substantially more accurate or precise results than using the original survey indices. The greatest potential utility for the integrated index approach is in simple index-based assessments.

#### **INTRODUCTION**

Many of the Northeast United States fish stock assessments conducted by Northeast Regional (NER) Stock Assessment Workshop (SAW) Working Groups and Atlantic States Marine Fisheries Commission (ASMFC) Technical Committees incorporate abundance indices from several state and federal agency research survey programs. Typically, these indices of abundance are provided to the assessment process as annual or seasonal indices at age. Use of

these indices ranges from: a) isolated consideration in single-index based assessments (i.e., as measures of stock abundance in relation to an index based reference point; e.g., for scup, black sea bass, and the skate stocks); b) use of single indices in calibrated analyses (e.g., lobster in a Collie-Sissenwine model); and c) use of many indices from many surveys for a range of age classes in complex age-structured calibrated analyses (e.g., striped bass, bluefish, summer flounder, and winter flounder assessments).

Evaluation of the utility of indices for inclusion in complex models using many survey indices has typically been accomplished by looking for common trends in abundance (i.e., signal) through: a) examination of time series plots; b) analysis of correlation (of lack thereof) between survey indices and between survey indices and population dynamics model results; c) outlier analysis; and d) consideration of the trend and magnitude of residuals (i.e., noise) when indices are included in population dynamics models. Multiple analyses with different sets of indices are often conducted to examine the sensitivity of results to inclusion of a given index series to determine the best analysis configuration to characterize stock status. Alternatively, all available abundance indices may be included in an analysis with the results most strongly influenced by those indices that statistically fit best within the analytical framework. Even given these approaches, with 50 or more indices of abundance at age to consider for inclusion in a complex age structured assessment, it can be difficult to discern general trends in abundance from the battery of available indices. The decision to include a given index time series at age can therefore often be subjective, based on a loose set of decision rules that may vary from one assessment to another.

Recent NER SAW peer reviews have recommended the investigation of methods to better integrate trends in stock abundance inferred from survey indices of abundance, prior to the inclusion of such indices in a population model calibration. For example, in the development of the NER index-based assessments for monkfish (NEFSC 1997), scup (NEFSC 1998) and skates (NEFSC 2000), extensive discussions occurred about which survey time series (i.e., NEFSC Spring or Fall) would best serve as the basis for biological reference points and the evaluation of stock status. A recent review of the NER summer flounder assessment (NEFSC 2002) included the following discussion:

- The SARC discussed the procedure for selecting survey indices used in the summer flounder VPA. The use of state surveys, which cover only a small component of the stock, was questioned. It was noted that YOY surveys may be variable due to the low numbers of fish caught per tow. The SARC requested that the standard error also be shown with the survey indices in the future. Whether differences in state surveys truly measure different trends in different components of the stock or whether differences are simply due to variation among survey was questioned.

and research recommendations:

- Explore the possibility of weighting survey indices used in VPA calibration by the areal coverage (i.e., in square kilometers) of the respective seasonal surveys.
- Evaluate trends in the regional components of the NEFSC surveys and contrast with the state surveys that potentially index components of the stock.@

A recent review of the NER black sea bass stock assessment (NEFSC 2004) also called for improved integration of survey indices to aid in the interpretation of stock abundance trends. That review recommended:

- More comprehensive evaluation of regional survey data is required to give more integrated indices of recruitment. For example, catch rates of recruits can be modeled as a function of location, time of year, and gear type in the surveys, to provide standardized indices, and
- Attempts should be made to extract as much information as possible from all time series considered using, for example, a GLM or GAM approach to combine the various surveys and gear types into a standardized index.

In a recent review of the NER bluefish stock assessment, the review panel (NEFSC 2004) recommended:

- There is a need for an integrated analysis of the many different research surveys for juvenile bluefish. The surveys cover different regions using different gear types and provide data on 0- and 1- group bluefish. It is recommended that serious consideration be given to... methods for standardizing and combining data from small scale intensive surveys with large scale less spatially intensive surveys, to give improved indices of recruitment.

Finally, another review of the NER summer flounder assessment (NEFSC 2005) recommended:

- Develop integrated survey indices by: combining the three NEFSC research trawl indices into a single annual abundance index, and combining state-run survey indices into a single annual abundance index.

In assessments like those for NER stocks of striped bass, bluefish, summer flounder, and winter flounder, the recommendations for development of integrated indices stem, in part, from the realization that the state agency survey data do not index trends for the entire stock, but merely components or substocks of the whole. While some state survey indices may, in fact, capture stock-wide trends, the peer-review panel research recommendations suggest that a method to statistically summarize and/or appropriately weight indices which are considered *a priori* to not adequately characterize stock-wide trends - to integrate them - will provide more reliable and transparent results than if the indices were simply used in their original form in Virtual Population Analysis (VPA) calibration.

The integration of survey indices collected by different research sampling programs can be viewed as analogous to the standardization analysis of commercial fishing vessel rates in developing fishery-dependent indices of abundance. Viewed in that light, a General Linear Model framework (GLM; SAS Institute 1999) can be used in which deviations from the mean trend are modeled by defining various classification variables which are thought to account for the deviations. This general approach has been used in several NAFO groundfish stock assessments to integrate multiple fishery-independent survey indices of recruitment (e.g., Healey et al. 2001 and subsequent Greenland halibut assessments, and Stansbury et al. 2001 and subsequent Grand Banks cod assessments). In the current study, four exercises were constructed

to explore and illustrate different approaches to the integration of indices of abundance in VPA calibrations of NER assessments.

## MATERIALS AND METHODS

### Exercise 1: simple, simulated survey data

As GLM modeling results can be strongly influenced by the assumed nature of the underlying error structure of the data (Terceiro 2003), the first step was to determine the appropriate error assumption to apply to research survey data. The statistical characteristics of *positive* catch data for summer flounder (*Paralichthys dentatus*) from the NEFSC Winter Trawl Survey for 1992, 1998, and 2004 were examined. Compiled on a total catch (numbers per tow) basis, the summer flounder data appear to resemble a Poisson or negative binomial distribution, although the majority of the catches (closest to the origin of the plots) reasonably approximate a lognormal distribution (Figure 1). A K-S test indicated that any of these distributions might be appropriate, with slightly better fit indicated for the Poisson (slightly smaller deviations from the expected). Terceiro (2003) indicated that inclusion of zero catch events (trips or tows) in such distributions increases the likelihood that the Negative binomial distribution will fit best. Most of the analytical models currently used in Northeast U.S. stock assessments, however, assume a normal or lognormal error structure, due mainly to variance estimation considerations.

The next step was to illustrate how combining indices into an integrated index should work given simulated survey data with known statistical characteristics and patterns. To this end, survey catch per tow data were simulated for 15 years and 2 seasons, with means ranging from 8 to 100 fish per tow and corresponding Coefficients of Variation (CVs) of 150% (standard errors ranging from 12 to 150), under a Poisson error distribution assumption. One hundred catch per tow values were randomly simulated for each year/season combination, for a total of 15 years \* 2 seasons \* 100 tows = 3,000 total tows. The annual sequence of the seasonal abundance indices was ordered to provide a time series pattern of a period of high abundance followed by a steady decline, followed by a relatively rapid increase, and then a short term decline. This exercise provided two realistic seasonal time series of survey abundance indices with: a) known statistical properties; b) slightly different annual rank orders; and c) generated a significant correlation ( $r = 0.7$ ) between the series comparable to that between the actual NEFSC Winter and Spring survey 1992-2005 time series for summer flounder ( $r = 0.66$ ; NEFSC 2005).

The 3,000 simulated individual tows were used as an input to a GLM model with year of sampling and survey season as the main effects classification variables. The goal was to derive an integrated abundance index from the two independent survey series - i.e., the GLM reproduction of the simple mean of two independent series with known characteristics. Models were run under lognormal, Poisson (true), and Negative binomial error assumptions. Normalized, retransformed year effect model coefficients served as the annual indices of abundance. This exercise was intended to demonstrate that if the assumption about the error distribution is correct, the GLM model should exactly extract the simple mean of two known series - i.e., a simple form of an integrated survey index.

## Exercise 2: Simulation of integrated indices at age

This simulation extended Exercise 1 to create integrated age-based indices, as might be used in an age-structured population model calibration (e.g., a VPA). Exercise 2 also explored the issue of weighting indices by the geographical coverage of individual surveys, as recommended by peer reviews of the NER stock assessments (see the Introduction). The intent was to simulate the averaging of multiple, individual survey indices at age into single, integrated indices of abundance, and compare the performance of four different index treatments in VPA calibration.

Three substock populations were simulated using NFT Popsim (NFT 2005a). The substocks were simulated with common biological and fishery characteristics (e.g., partial recruitment to the fishery and magnitude and time series patterns of fishing and natural mortality), but with different initial proportions of the additive, total stock numbers in Year 1 at ages 0 (recruits) through age 6. The magnitude of the correlation between the three simulated indices (ranging from 0.3 to 0.4, or borderline significance at the  $\alpha = 10\%$  level for degrees of freedom of about 20 observations; Rohlf 1981) and between the three simulated indices and the true substock sizes (ranging from 0.5 to 0.7) was made comparable to that observed in recent summer flounder assessments (NEFSC 2005, Terceiro 2006) so as to lend realism to the simulation. In actual assessments, indices with a poorer correlation than these are generally excluded from the VPA calibrations in preliminary screening work (NEFSC 2005, Terceiro 2006). Error was incorporated into the catchability coefficient ( $q$ ) of each of the three simulated substock abundance indices at recruiting age 0 for the 21 years (random error with CV = 100%, 100%, and 150%) to ensure a realistic degree of deviation from the True Total Stock (TTS) sizes. The catch from each substock was simulated without error, to isolate the effects in the VPA calibration caused solely by the treatment of the age 0 indices. The percentages that each substock accounted for of the TTS numbers was set at 50%, 40%, and 10%. The simulated catch and population numbers were summed to provide the TTS catch and population numbers.

To create an integrated index for use in the four VPA calibration treatments, the three 21 year time series of simulated age 0 indices were averaged to single integrated age 0 index series within GLM models. Both simple (unweighted) and stratified (area-weighted) integrated indices were compiled. This step was intended to reconfirm the conclusion of exercise 1, but on an index-at-age basis: to establish that the GLM can exactly extract the means, simple or stratified, of multiple input time series of indices of abundance to create an integrated index of age 0 abundance. The areal coverages of the respective surveys were set at (63%, 31%, and 6%) [different from the TTS percentages in numbers (50%, 40%, and 10%)] to explore the impact of such differences (i.e., what if the assumption that survey area coverage = percentage of total stock is wrong?) on integrated index modeling and VPA calibration.

In the final step of Exercise 2, the use of the four index treatments was explored in an ADAPT VPA (NFT 2005b) calibration for the TTS catch at age and the differences summarized. The normalized versions of all indices (each value divided by its time series mean) were used to remove scale effects prior to calibration. Only the age 0 index treatments were used as VPA calibration indices. Stock sizes for ages 1-6 were calculated using the known, input fishing mortality rates and a partial recruitment vector. Both deterministic (one-time run) and stochastic (1000 bootstrap iterations of the age 0 index calibration residuals) VPA calibrations were explored.

The four age 0 index treatments were:

- 1) three age 0 substock indices, simple (unweighted)
- 2) three age 0 substock indices, stratified (area weighted in the VPA calibration)
- 3) one GLM integrated age 0 index, simple (unweighted)
- 4) one GLM integrated age 0 index, stratified (area weighted in the GLM)

### **Exercise 3: Real data GLM integrated indices of abundance at age**

In Exercise 3, the GLM approach was used with actual research survey data to calculate integrated indices of abundance at age for use in VPA calibration. Data from a recent NER assessment (NEFSC 2005) for summer flounder were used as an empirical test case. The time series of years for the fishery catch and research survey indices was 1982-2003/2004; the VPA calibration used survey indices at age (0-7+) from three seasonal NEFSC trawl survey series and 12 seasonal state surveys. As previously noted in the Introduction, the analytical approach is analogous to a GLM standardization analysis of commercial fishing vessel catch per unit effort data: the Ayear@ main effect classification variable serves as the index of abundance, while the Asurvey@ classification variable is analogous to a Avessel@ classification variable, each with its own time series of catch per unit effort that has some relationship to the underlying true abundance of the stock. The mean index of abundance is modeled as a log-linear function of the classification variables. The analysis could be expanded by including additional classification variables, such as the sampling gear type or tow duration, temporal variables (e.g., spring/fall; day/night) or environmental variables (e.g., water temperature anomalies). However, such details typically are not available for most assessments, and indices are most often presented as aggregate annual or seasonal indices at age. As configured here, the analysis provides average, or integrated, annual indices of abundance at age.

Examination of the observed distribution of the normalized summer flounder age 0 survey indices suggested that the indices were best characterized by either a lognormal or Poisson/Negative binomial distribution. The standard error of the indices is slightly less than the mean (mean = 1.0, standard error = 0.8, skew = 2.8), with a single data point accounting for the high skewness. K-S tests indicated that the Poisson and negative binomial expected distributions were the same, and slightly better than the expected lognormal distribution in fitting the observed mean and variance. Visual differences (observed minus expected) were similar for the three expected distributions. Since the indices were to be lognormal-transformed in the ADAPT VPA calibration (NFT 2005b), and the age 0 indices represent the largest group of indices with the greatest absolute value range (and hence provide the best age for which to reliably examine statistical properties), it was concluded that GLM modeling under a lognormal error distribution would be reasonable for all ages in this exercise.

GLM models were constructed for ages 0, 1, 2, 3, 4, and 5-7+. Main effects were limited to the year of sampling (1982, 1983...2004) and the identity of the survey (NEFSC age 1, NEFSC age 2...NEFSC age 5-7+). The resulting year effect coefficients, corrected for lognormal-transformation bias and re-transformed to the original scale, were used as a single index of abundance at age 0 input to the VPA calibration in place of the twelve original survey series. The input GLM age 0 vector was called GLM\_YOY. The corresponding VPA run using this vector was called VPA\_GLM0. In VPA\_GLM0, for example, all of the original indices for all the other ages (1, 2, 3, 4, and 5-7+) were retained so that the effect of using the GLM\_YOY vector could be isolated. The pattern was repeated as GLM vectors (GLM\_1, GLM\_2...GLM\_5:7) for the other ages tested. A run using only the GLM vectors at age

(VPA\_GLM) was also constructed. Results from these seven GLM integrated index run configurations were compared to the trends in stock size at age provided by the VPA calibration run (F04\_ALL) using the original, full suite of indices at age.

#### **Exercise 4: Real data GLM integrated indices at age, NEFSC vs. State**

The 2005 SARC 41 Panel review of the NEF summer flounder assessment (NEFSC 2005) recommended the development of integrated survey indices by combining the various seasonal NEFSC research trawl survey series indices at age into single annual abundance indices at age (e.g., NEFSC age 0 index, age 1 index, etc.), and likewise combining the state survey indices into a single annual abundance indices at age. In Exercise 4, the GLM approach was used with the same data as in Exercise 3 to construct integrated indices at age from the three seasonal NEFSC surveys (winter, spring and fall) and from the state surveys (MA, RI, CT, NJ, MD, VA, NC), for a total of twelve GLM integrated indices at age (NEFSC ages 0-5:7+; State ages 0-5:7+). Considering the series in this manner resulted in more inconsistent data in terms of the length of the series, and more frequent occurrence of >zero@ observations. Therefore, the resulting GLM integrated ANEFSC@ and AState@ indices exhibit a greater number of missing observations for some year and age combinations than did the six GLM integrated indices at age for all surveys combined constructed in Exercise 3. Given the extent of Exercise 3, comparisons in Exercise 4 were limited to a VPA calibration using the 12 GLM integrated indices (VPA\_NEC\_ST) and the VPA calibration (F04\_ALL) using the original suite of indices at age.

### **RESULTS**

#### **Exercise 1: simple, simulated survey data**

Table 1 shows the time series of annual means of the two simulated seasonal survey indices, the combined annual means of the two simulated series, and retransformed GLM year effect coefficients (annual indices of abundance) under lognormal, Poisson, and negative binomial error assumptions. As the two seasonal series were simulated with Poisson error, the expected result was that the retransformed Poisson coefficients would exactly match the combined mean of the two input series, while the lognormal and negative binomial results would differ slightly. For ease of comparison, all results were rescaled to the means of the respective series in the bottom of Table 1. The results demonstrate that if the error distribution is correctly specified, the GLM model can exactly reproduce the combined mean of averaged survey series.

#### **Exercise 2: Simulation of integrated indices at age**

The Year 1 numbers at age of the three substock populations (SS1, SS2, SS3) simulated using NFT Popsim (NFT 2005a) are presented in Table 2. The catch and population numbers were summed to provide the true total stock (TTS) catch and population numbers. The panels in Figure 2 show the relationship between the simulated age 0 population sizes in the three substocks and the respective simulated age 0 survey indices over the 21 year time series. Figure 3 presents the trends in age 0 stock size, age 1-6+ stock size, and age 0-6+ catch in the simulated VPA used to explore the sensitivity of the VPA calibration to different treatments of the age 0 indices.

The simulated integrated indices of age 0 abundance using simple arithmetic averaging and GLM modeling are presented in the upper section of Table 3. As noted earlier, Astratified@ equates to area weighted; rescaled indices (divided by the time series means) are presented in the lower section of Table 3. The results re-confirm those of Exercise 1, that given the correctly specified error distribution, the GLM model can exactly reproduce the combined mean of averaged survey series.

VPA calibration results for the four treatments of the age 0 indices (VPA1 = simple mean, VPA2 = stratified mean, VPA3 = simple GLM, and VPA4 = stratified GLM) differ from the True Total Stock (TTS) and also from each other mainly in the Auncovered@ part of the VPA in Years 14-21 (Table 4). Because the area weights intentionally did not match the true substock percentages, the stratified mean (VPA2) and stratified GLM (VPA4) treatments generated calibration results that deviated more (both on an aggregated deviation and mean deviation basis), and correlated less well (Pearson r) than the simple mean (VPA1) and simple GLM (VPA3) treatments. Since the area weight was highest for SV1 (63%), the weighted index treatments (VPA2 and VPA4) correlated best with the SV1 index, and poorest with SV2 and SV3, than the simple mean (VPA1) and simple GLM (VPA3) treatments. In this exercise, the smoothing effect of the simple GLM model of the indices produced VPA calibrated stock sizes that deviated from the TTS sizes slightly less, on both aggregate and mean bases, than the simple mean treatment (Table 4, Figure 4).

VPA bootstrap results were qualitatively similar to the one-time runs, and with the focus on the Year 21 age 0 stock size estimates, show how the incorrect assumption of survey area coverage as a proxy for stock size percentages can provide inaccurate results. As in the one-time runs, the simple (unweighted) VPA1 and VPA3 bootstrap estimates more closely match the TTS size for age 0 in Year 21 than the stratified (area weighted) VPA2 and VPA4 estimates (Table 5). The smoothing effect of the GLM on the integrated age 0 index in the VPA3 calibration produces a larger deviation from the TTS size than the simple three index VPA1 calibration. Finally, while the VPA2 estimate (54,107) is most precise (CV = 0.11; due to the good correlation of estimated stock sizes and the SV1 index), it deviates most from the TTS size (92,000).

### **Exercise 3: GLM using real indices of abundance at age**

The results for the age 0 indices in exercise 3 are first provided in the upper left panel of Figure 5, where the pattern of age 0 stock sizes indicated by the GLM model estimated year effect vector (the integrated index at age 0, GLM\_YOY) is compared with the estimates from the VPA (VPA0\_GLM0) when this single, integrated age 0 index is used in place of the 12 original indices to calibrate age 0 stock size. The overall patterns are similar, with highest recruitment at the start of the series and a poor year class in 1988. The major difference is in the rank order of the 1982/1983 and 1985/1986 year classes. The upper left panel of Figure 6 compares estimates of age 0 stock size from VPA\_GLM0 (using the integrated index for age 0, and the original indices for ages 1 and older) with the VPA using the original survey series for all ages (F04\_ALL). In the two VPAs, the estimates of age 0 abundance are nearly identical. Exercise 3 results for ages 1, 2, 3, 4 and 5-7+ are provided in the successive panels of Figures 5-6. A VPA calibration was also conducted using only the GLM integrated indices (i.e., 6 index series at ages 0-5:7+), and these results are presented in Figure 7.



In general, the GLM integrated indices at age diverged somewhat from the VPA\_GLM estimates, due to the smoothing effect of the GLM and possibly due to process error caused by mis-specification of the true error structure. However, the VPA\_GLM and F04\_ALL estimates are nearly the same for all ages, diverging only in the most recent 2-3 years in the unconverged part of the VPA. This last finding reflects the substantial influence on stock size estimates of the input catch at age data and the convergence properties of the VPA model. The F04\_ALL VPA calibration is characterized by a substantial retrospective pattern, with F underestimated and stock size overestimated over the unconverged part of the analysis. The retrospective patterns for F, SSB, and recruitment at age 0 (R) are nearly identical for the VPA\_GLM calibration, indicating no improvement in this characteristic of the analysis by using integrated indices of abundance (Figure 8).

Exercise 3 results suggest that using GLM integrated indices may increase the difficulty of interpreting the uncertainty of the VPA estimates. VPA calibrations based on a limited number of externally derived GLM integrated indices are likely to have less total absolute variance than calibrations with multiple sets of indices; an example is the difference in the Residual Sums of Squares (RSS) and Mean Squared Residual (MSR) between the F04\_ALL and VPA\_GLM runs. The VPA\_GLM MSR is about one-third of the F04\_ALL MSR, indicating an overall Abetter fitting@ model (Table 6). However, the number of potential calibration residuals in the VPA\_GLM run is also much lower (130 versus 937 in the F04\_ALL run), and so estimates of individual stock sizes, and subsequently derived quantities such as Average F and Biomass, are less precise (a Adegrees of freedom@ phenomenon). This is evident in both the deterministic Nonlinear Least Squares (NLLS) and Bootstrap (1000 iterations; BOOT) results for the F04\_ALL and VPA\_GLM runs (Table 6).

#### **Exercise 4: GLM Integrated Indices, NEFSC vs. State**

Figure 9 compares the GLM integrated indices at age derived from the NEFSC survey indices at age are compared with those derived from state survey indices at age. Consistency in trend and rank order between the NEC and ST indices at age is poorest for ages 0 and 1, and best for ages 3 and 4, but overall is very similar across all ages. The use of the twelve GLM integrated indices at age in a VPA calibration, the VPA\_NEC\_ST run, produced estimates of stock size at age that were generally slightly lower than the F04\_ALL run in the unconverged (most recent) years of the analysis. As a result, the estimated total stock size is slightly lower for the VPA\_NEC\_ST run compared to the F04\_ALL estimate, and correspondingly the average fishing mortality rate (F) is slightly higher (Figure 10). Finally, as with the Exercise 3 comparison, the total variance (RSS) for the integrated index VPA\_NEC\_ST run is smaller than for the F04\_ALL run. However, the VPA\_NEC\_ST run Mean Squared Residual (MSR) is higher than the F04\_ALL run, indicating a slightly poorer fit. As well, the VPA\_NEC\_ST run provided larger CVs on the estimated parameters, in both the deterministic (NLLS) and bootstrap (BOOT) runs (Table 7). The overall fit of the NEC integrated indices was similar to the ST integrated indices, with the NEC integrated indices accounting for 51.5% of the total variance in the fit and the ST integrated indices 48.5%. NEC integrated indices at age fit better (i.e., smaller partial variance) for ages 2, 4, and 5-7+; the ST indices fit better for ages 0, 1, and 3 (Figure 11).

## CONCLUSIONS

The results of Exercises 1 and 2 suggest that use of a lognormal error distribution in constructing integrated indices in a GLM framework can introduce some degree of process (model) error to these indices because of mis-specification of the true error distribution of survey catch data. Future developments should consider alternative error distribution assumptions. Such alternative assumptions, or use of non-parametric approaches such as General Additive Modeling (GAM), would also permit the use of Azero@ observations in the calibration which are generally treated as missing observations in lognormal models.

The inclusion of auxiliary information (e.g., environmental data) in the GLM modeling could theoretically improve the accuracy and utility of integrated indices. If fine-scale auxiliary data are available and have predictive utility, integration of indices at the tow or stratum level could be easily accomplished. Further research should consider alternative modeling frameworks such as GAM or ordination approaches such as Principal Components Analysis (PCA) which could incorporate non-parametric assumptions and smoothing. Results of exercises using real summer flounder data indicate that without the inclusion in the GLM model of significant main effects (beyond year of sampling and survey identity) that account for a large proportion of the variance of survey series at age from the simple overall means, use of a GLM to develop integrated indices at age provides no clear advantage over using the original indices as input to the VPA calibration. While the GLM integrated indices provide a useful summarization of mean survey trends, the use of integrated indices as VPA calibration input does not guarantee substantially more accurate or precise results than calibration using the original survey indices.

A number of stock assessments in the Northeast United States rely on a single, seasonal time series of survey indices, selected from among several candidate series, as the sole means of evaluating the status of the stock with respect to an index-based reference point. For those situations, the construction of an integrated index of abundance from several different time series could provide a more robust approach to the evaluation of the status of a stock. Therefore, the greatest potential utility for the integrated index approach may be for simple index-based assessments.

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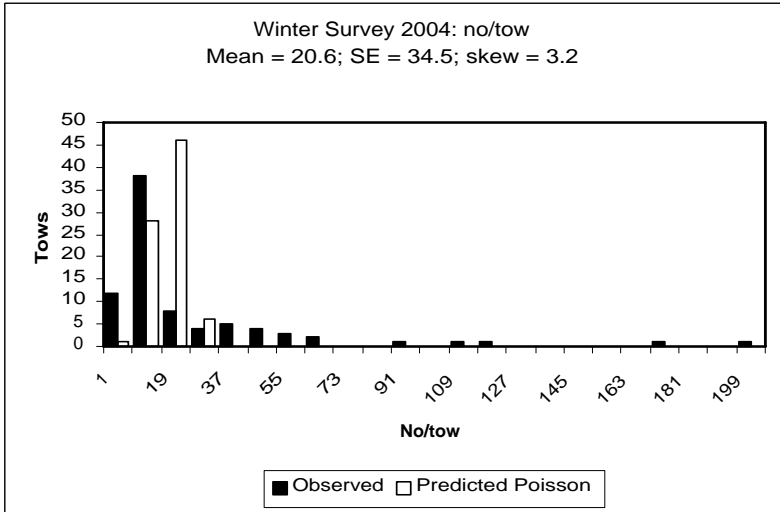
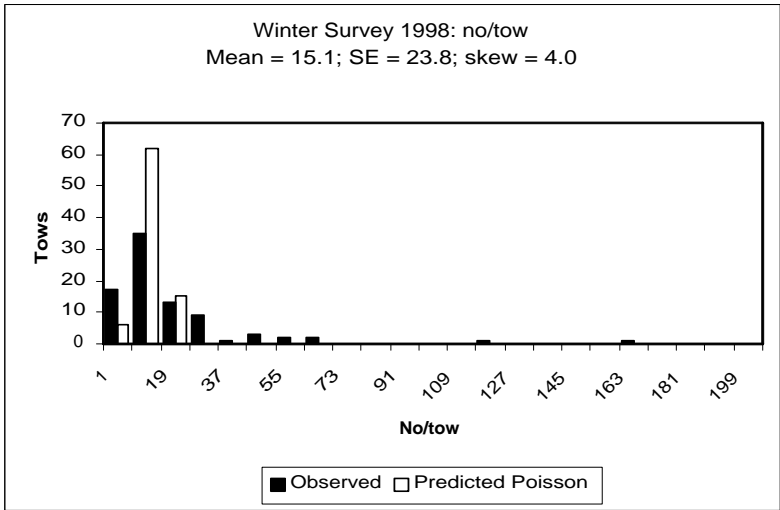
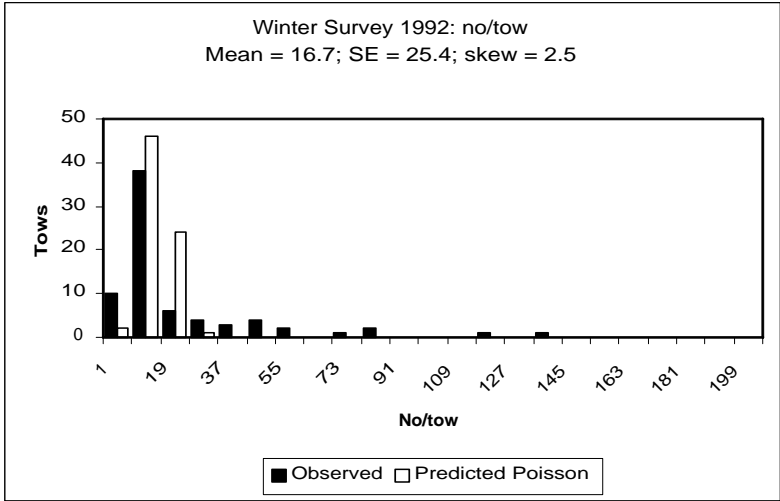


Figure 1

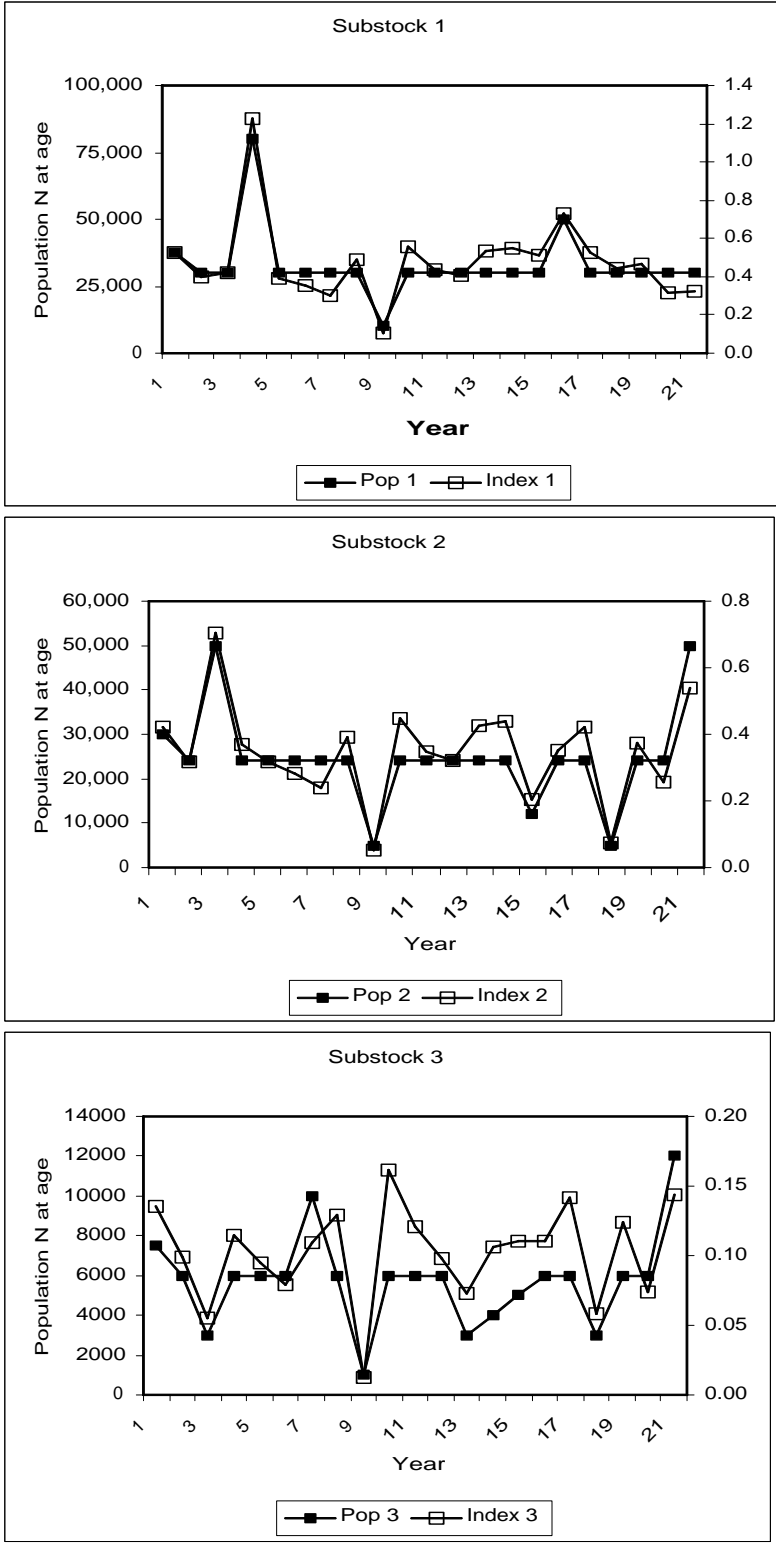


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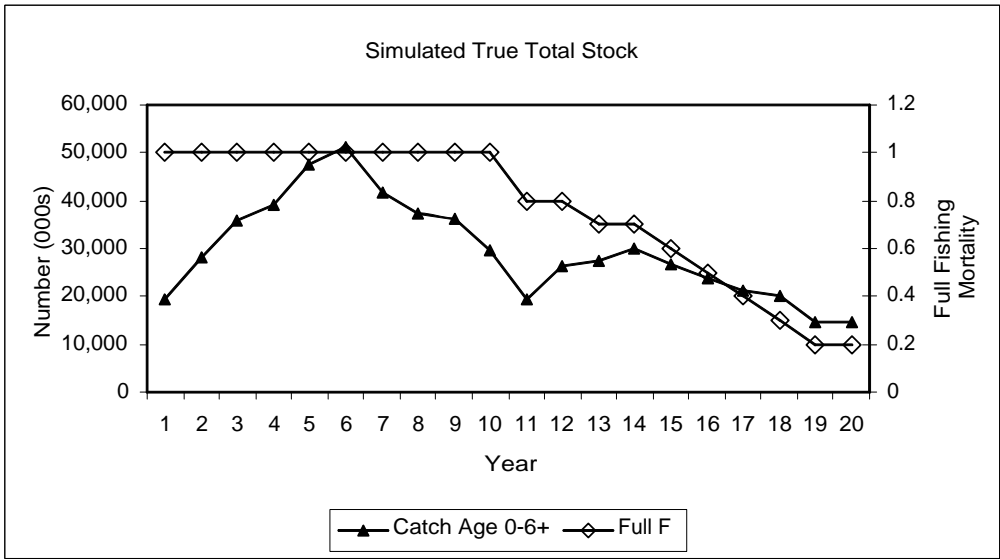
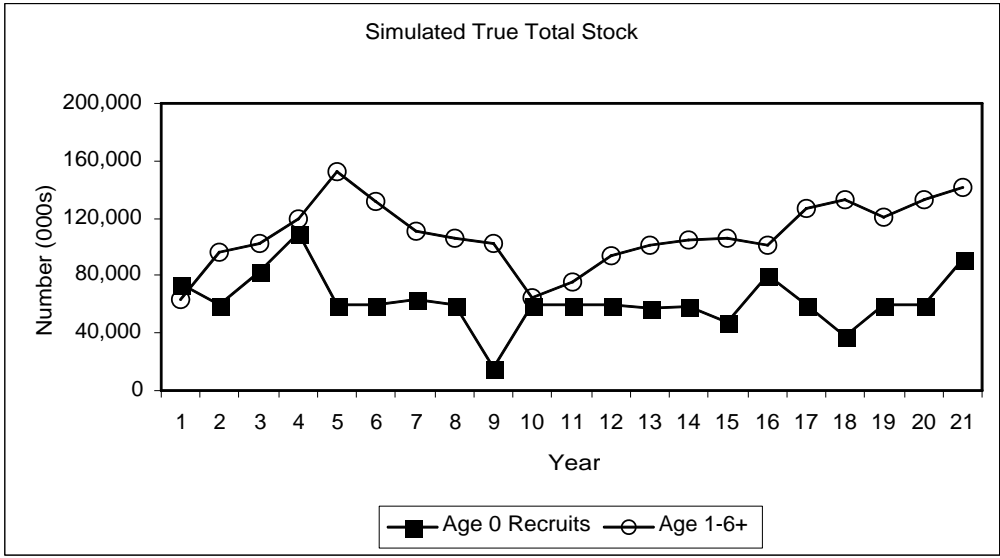


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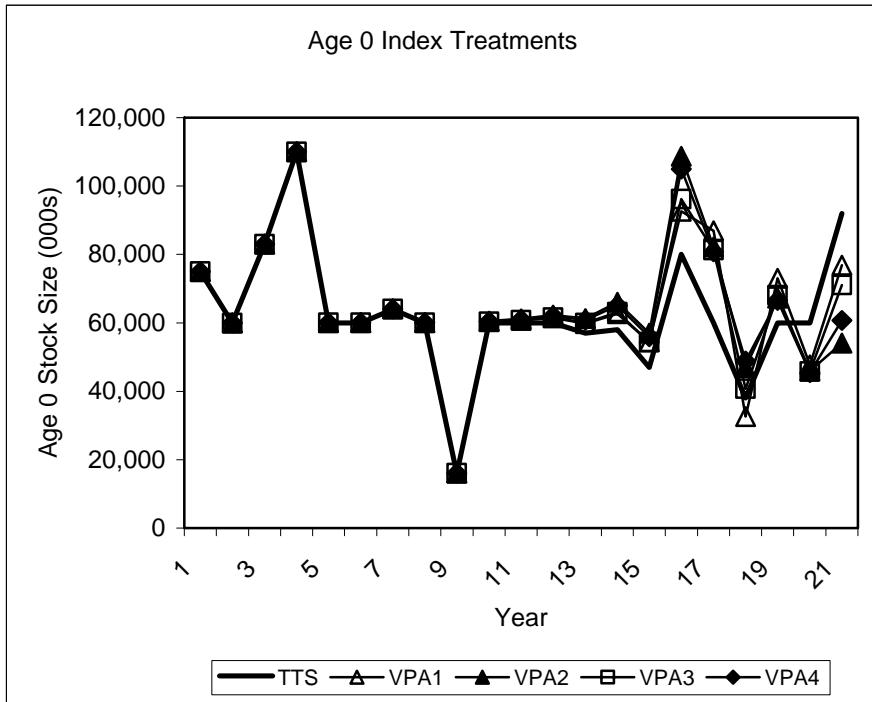


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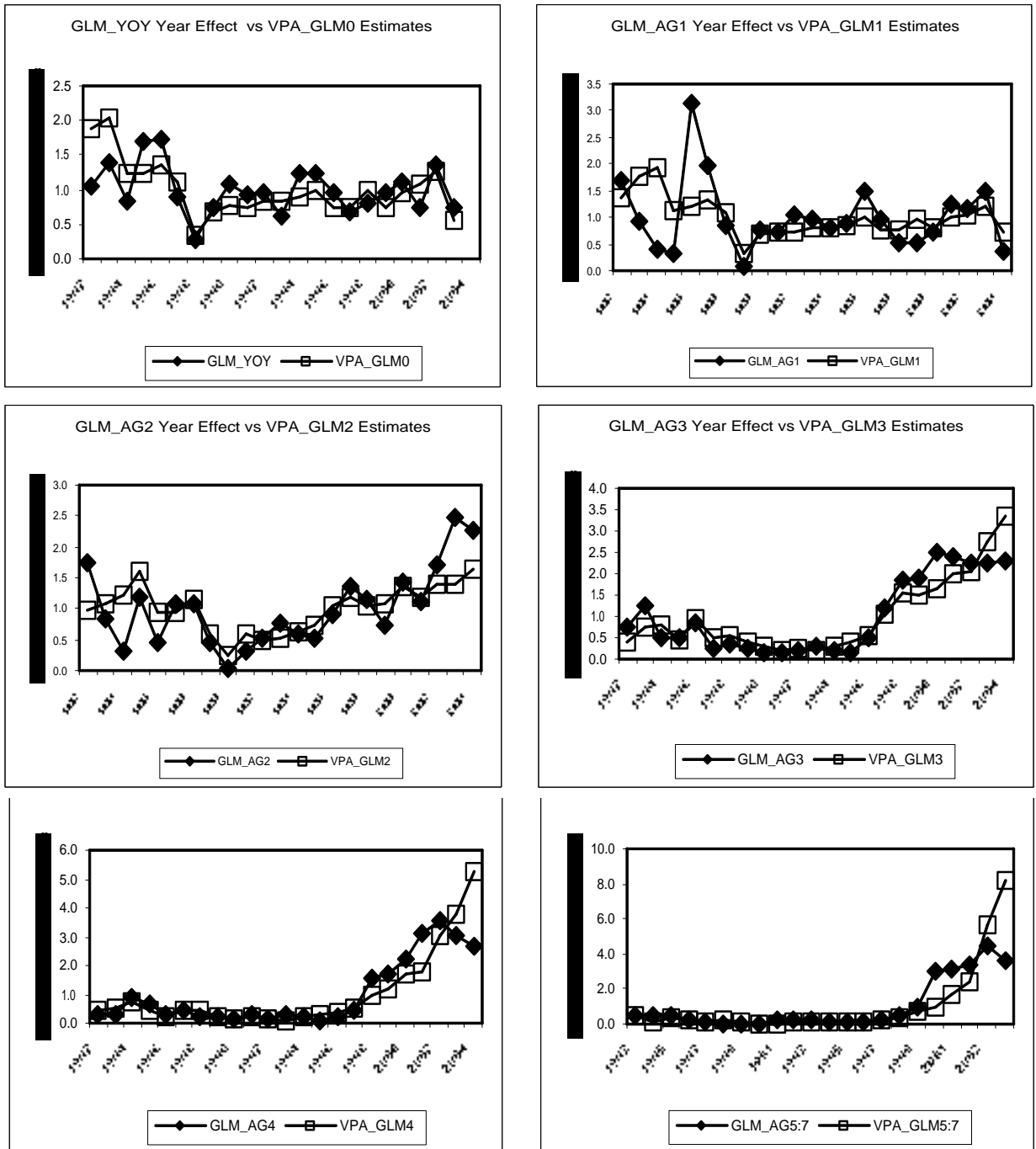


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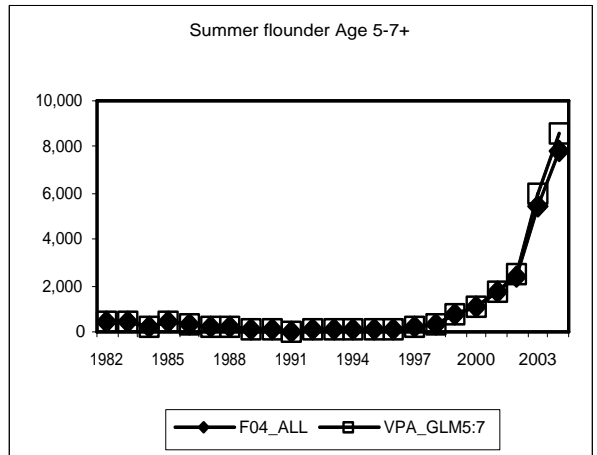
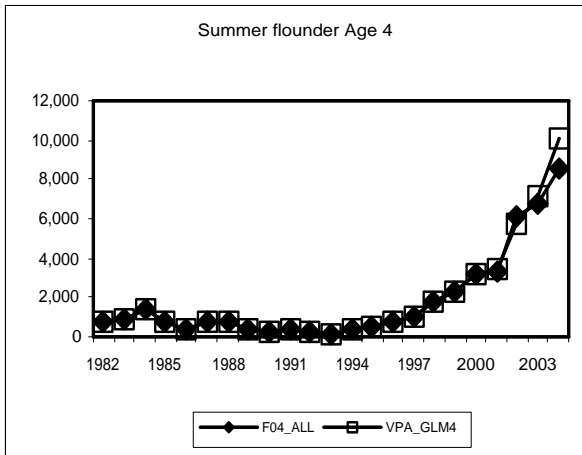
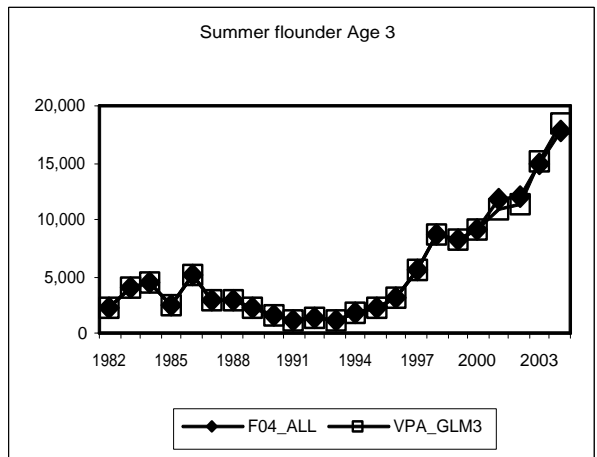
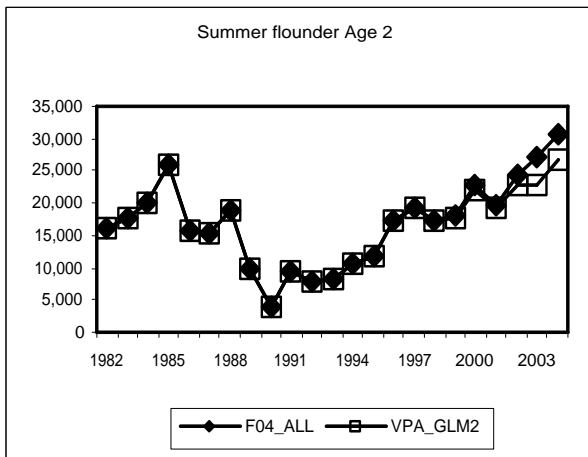
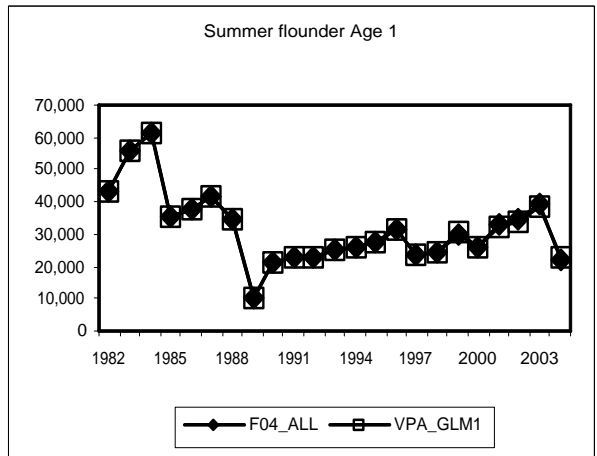
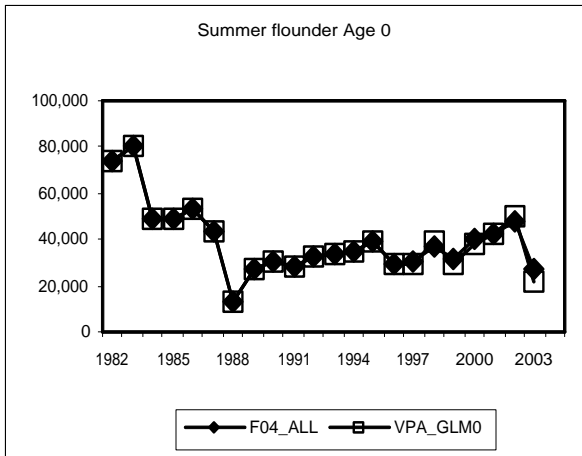


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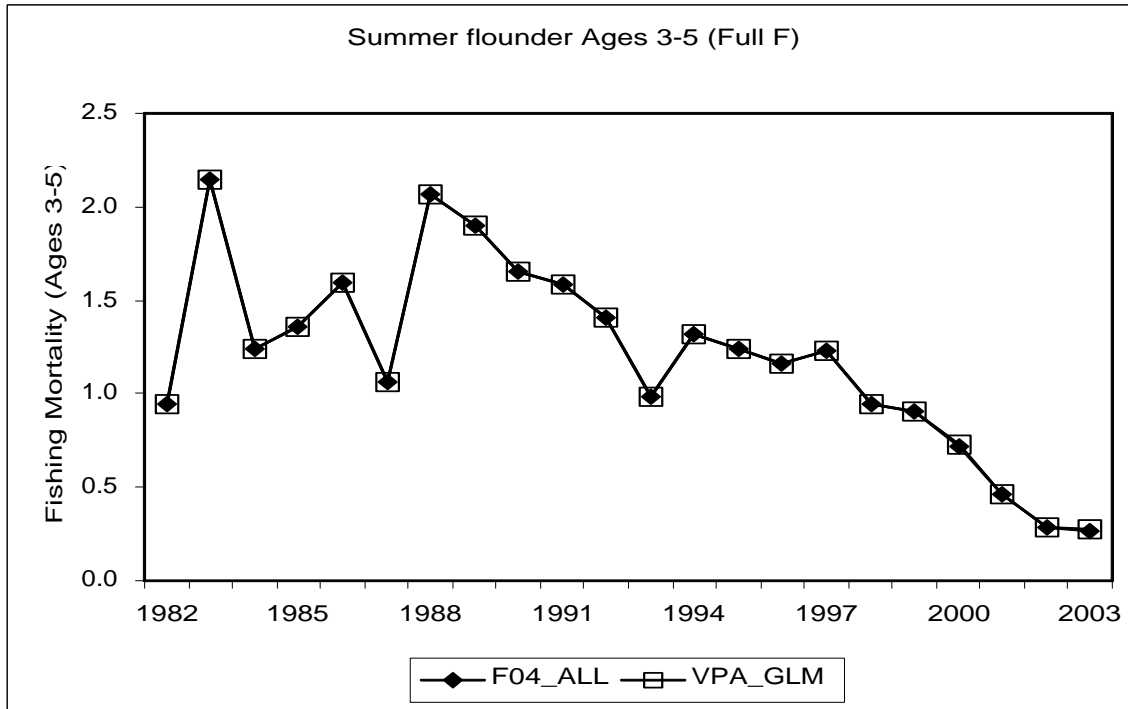
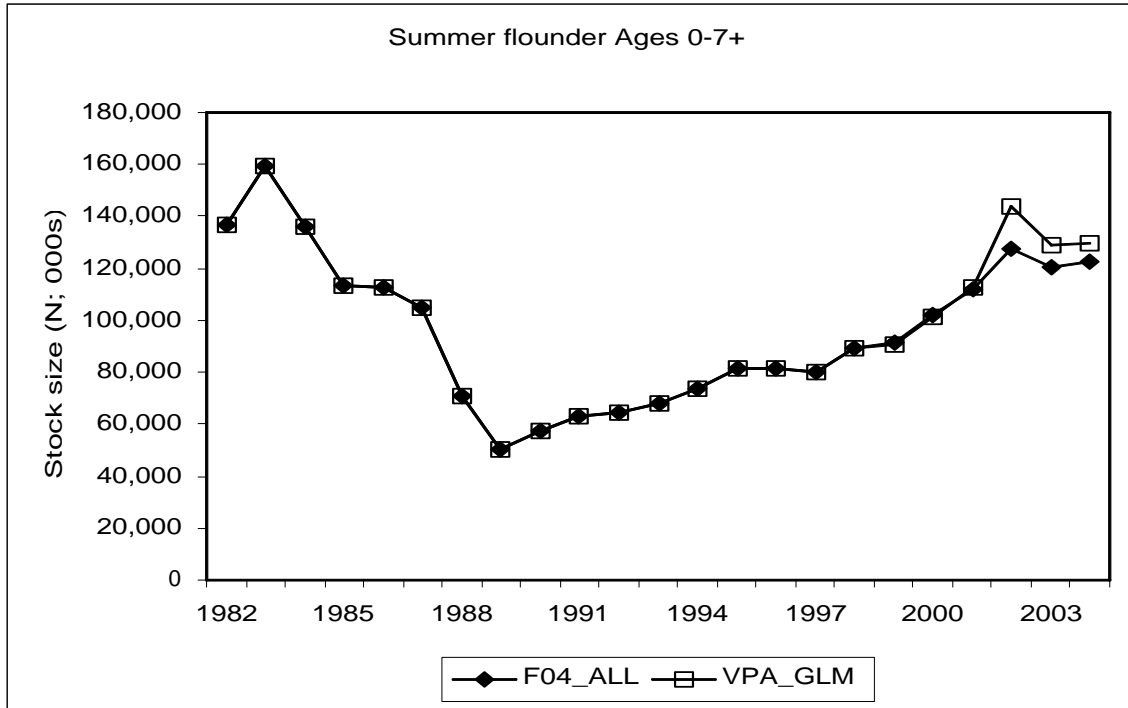


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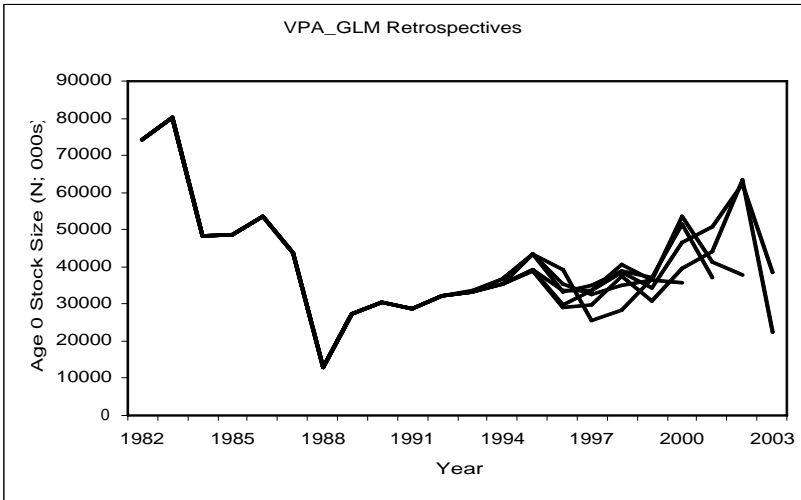
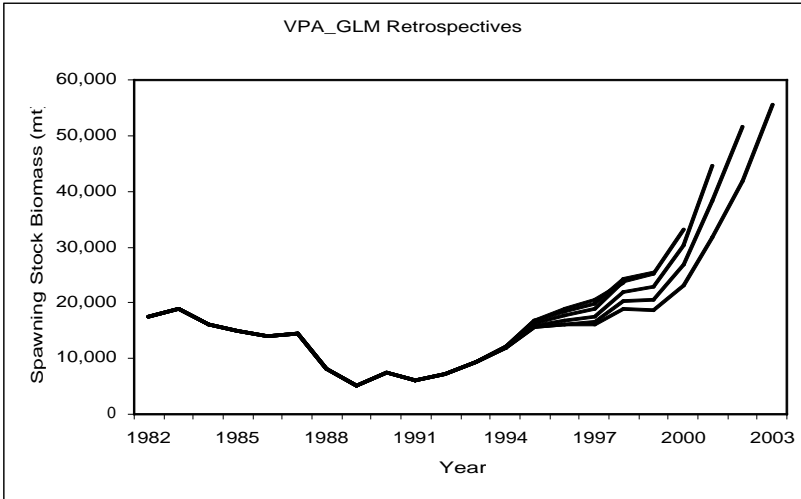
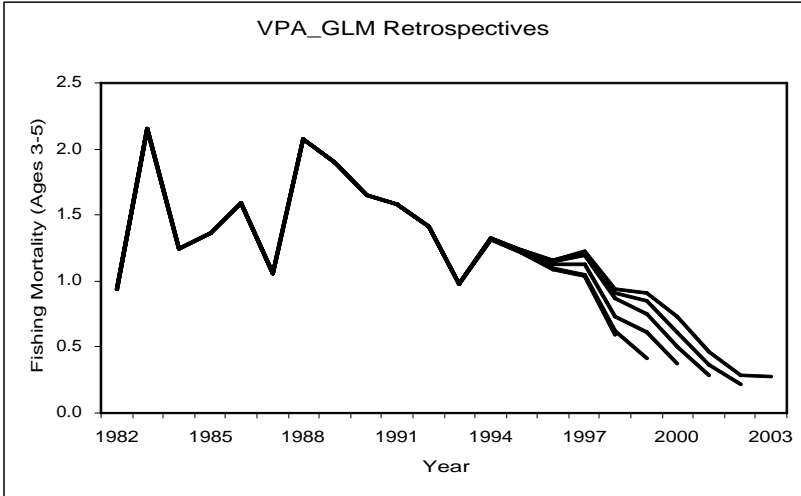


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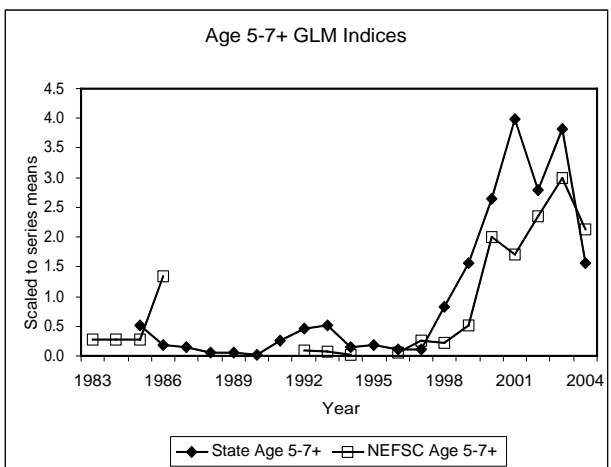
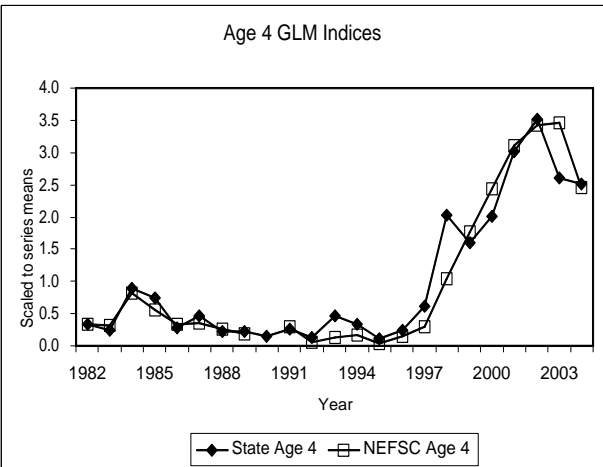
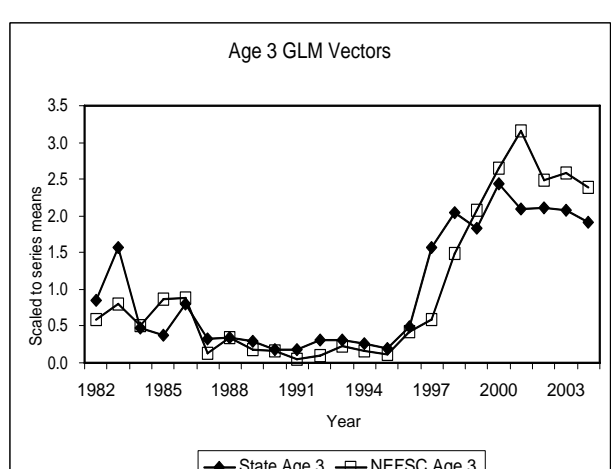
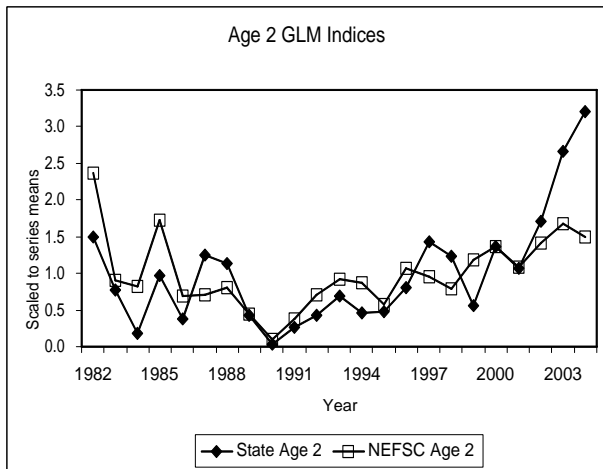
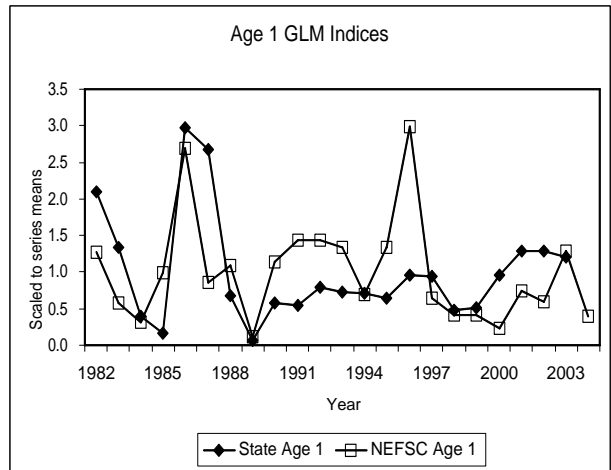
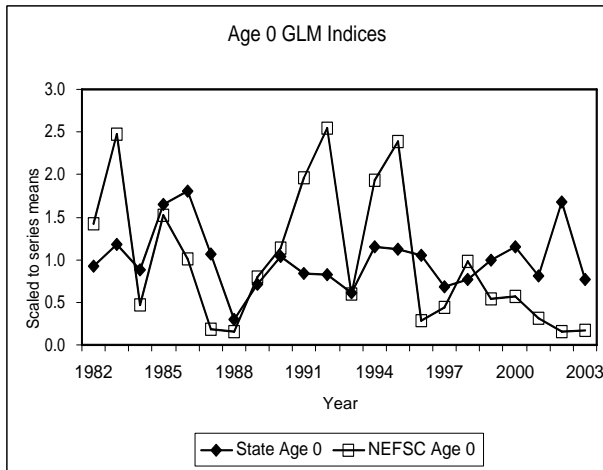


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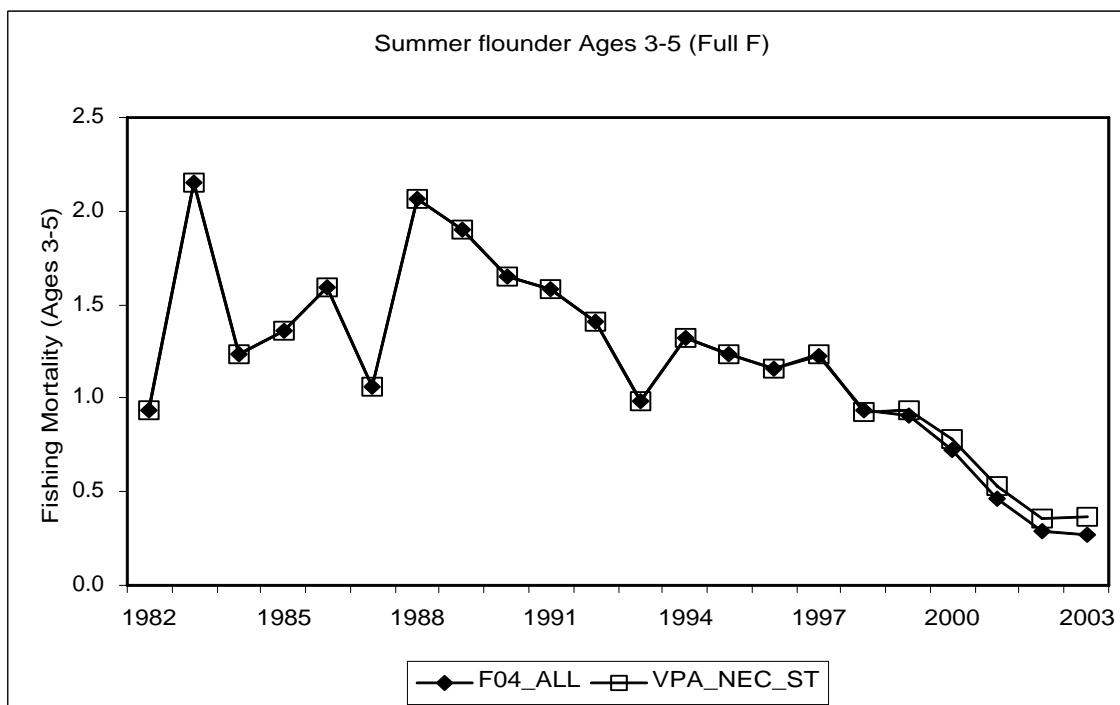
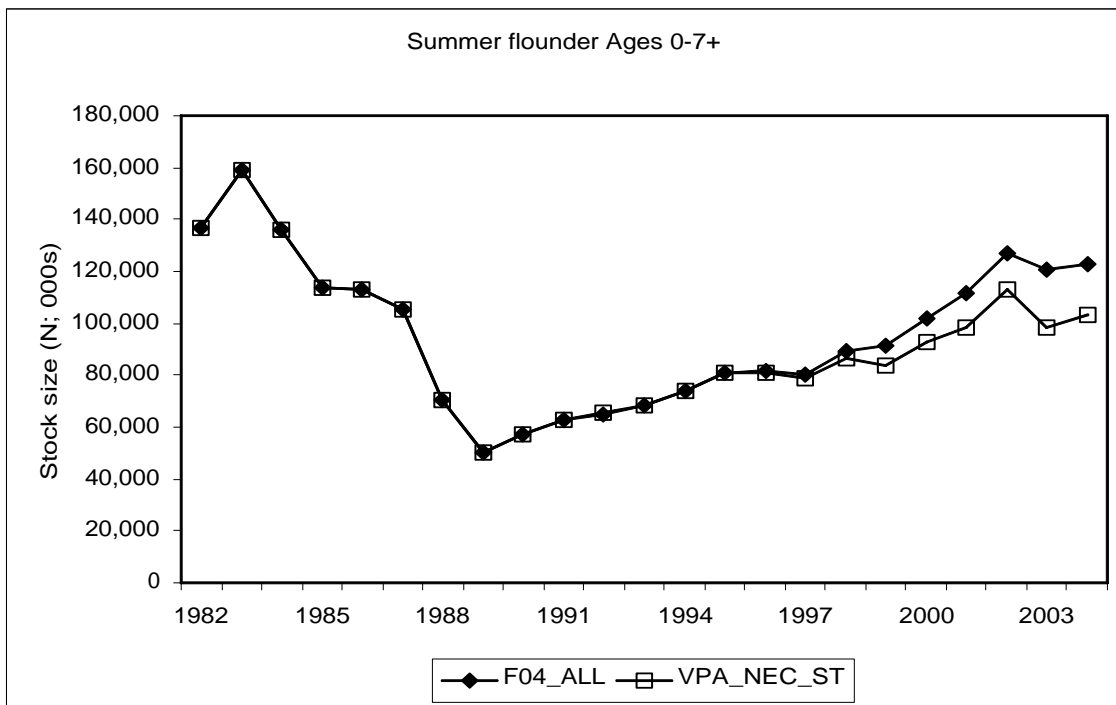


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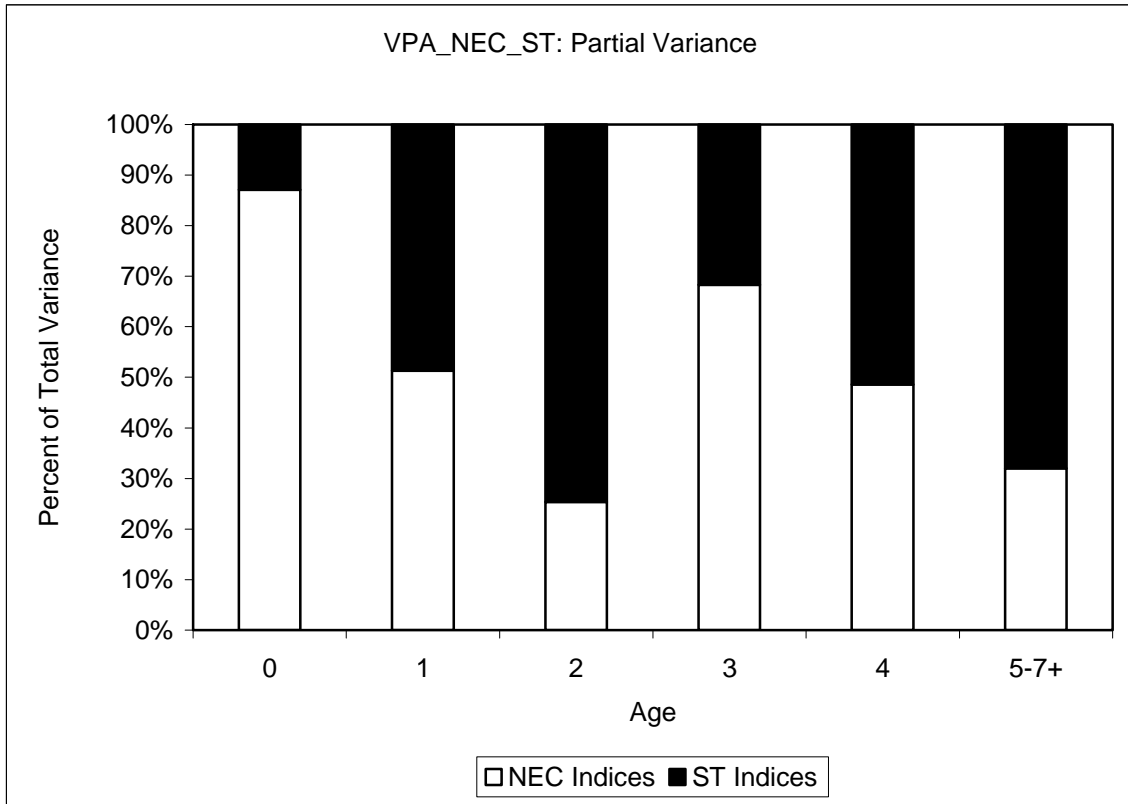


Figure 11.

**Simulation Studies of Issues Associated with  
Filling Zeros in VPA Tuning Indices**

by

Chris Legault and Al Seaver

**Introduction**

Recently, the 2006 assessment of summer flounder (Terceiro 2006) was subject to a NMFS Office of Science and Technology (S&T) Peer Review (Methot 2006). Among the recommendations made by the S&T Peer Review panel was the following:

*The Panel finds that one immediate modification of the VPA is justifiable and reduces the retrospective pattern in stock size during 2003-2005. The VPA model currently treats survey observations of zero as missing values. An observation of zero for a particular age of fish in a particular survey year does not mean that there are no fish of that age in the stock, only that the number of survey samples was not sufficient to detect any fish of that age. This VPA model, as with most assessment models, tunes to the logarithm of the survey observations so cannot explicitly deal with observations of zero. However, treating these zeroes as missing values can result in a bias because time periods of low abundance are underrepresented in the data input to the assessment model. In the case of summer flounder, the result may be an underestimate of the degree to which the stock has rebuilt since the low levels that occurred around 1990. The committee did not discuss this issue during the Sept 14-15 meeting, so is not prepared to present a definitive solution. An interim approach would use a small value in place of the zeroes. A value equal to one sixth of the smallest observed positive value would be reasonable until a more complete statistical solution can be developed.*

This recommendation departs from the standard practice in NEFSC assessments of treating zero values in tuning indices as missing values. To more fully understand the implications of this suggested change, two types of simulation analyses were conducted. The first is a simple spreadsheet example of how a single time series is impacted by different levels of fish detection and the implications for a full VPA. The second is a full simulation that generates many random sets of data for VPA from a known case, creates zeros for some of the indices in some years, and compares different methods for dealing with these zeros, including treating them as missing values, replacing the zeros with a fixed small value, and the one sixth of the smallest observation rule.

**First Study: Impact of Zeros on One Time Series**

A population that declined and then increased was created artificially. A catchability coefficient was applied to generate a survey time series exactly from the data. The values in the time series were rounded to two, one, and zero decimal places creating observations of zero for 2, 4, and 7 years, respectively (Table 1). A series of constants was added to the time series ranging from 0.0001 to 10 so that the holes were filled. A new catchability coefficient was calculated that minimized the difference between the true population and the observed survey time series which had been modified to fill the holes. This was done to show how a model would need to change the predicted values to more closely match the observed series. In this study, treating the index values as missing results in an exact match between the observed and predicted values, due to the formulation of the problem and so are not considered further.

The differences between observed and predicted values depend strongly on the constant added to the time series (Figs 1-3). Adding a large value, such as 10, causes the survey time series to flatten relative to the true population. A model would try to reduce the change in the population in this case. Conversely, adding a very small value, such as 0.0001, causes the survey time series to exhibit a stronger decline and recovery than the true population. In this case, a model would try to increase the changes in the population. Adding one sixth of the minimum observed value appears to be an objective way to determine a value that is not too big or too small for the round 2 case where only two zeros are replaced.

However, the more disturbing result seen in these simulations is that the addition of a constant value to replace the zeros in a survey time series artificially imposes a pattern that may not match the actual pattern in the population. This is most clearly seen in the round 0 case where seven zeros are filled with the same value even though the true population declines then increases during the seven year period.

## **Second Study: Simulation Analysis of Different Methods of Treating Zeros**

A comparative study was performed using the POPCOMP length based population simulator tool and VPA version 2.3.3. The objective was to examine the effects of using indices of abundance with some portion of the index data treated as missing or alternatively replaced with an imputed value. Four scenarios were examined. In each case the simulated data were sampled to create 100 realizations of VPA input data and the results of the multiple realizations were compared in their ability to recover the true stock numbers and fishing mortality at age. The test was performed in such a manner as the VPA files created for each realization would be the same for each scenario except in the specified removal and alternative replacement of index data based on an input cut point.

The simulated population was loosely based on the summer flounder assessment with the population initially declining due to high  $F$  ( $>2$ ) and then rebuilding as  $F$  was lowered to  $<0.5$ ). The simulated population spans 24 years starting in 1982 and consisting of 8 age classes with the last age class acting as a plus group. Natural mortality was 0.2 for all ages and years. Both recruitment and fishing mortality vary widely over the time series. The growth projection matrix was created using von Bertalanffy growth coefficients and length bins ranging from 10 to 84 cm. A logistic equation was used for fishery selectivity at length. Catch was removed from the population based on the true  $F$  but samples were collected from four market categories based on size (sample sizes 65-133 per 100 metric tons) to introduce variability in the catch at length. Age-length keys were created based on sampling 25% of the observed lengths and an ageing error matrix was included to introduce variability in the catch at age (mis-aged proportions



ranged from 4% to 17%). The length-weight equation coefficients supplied to allow expansion of sampled catch to total landings, which had a small amount of variability relative to the true landings ( $CV = 0.01$ ). Discards were not included in this simulation. This level of uncertainty in the catch at age is thought to be representative of the level associated with the summer flounder assessment. However, there is not a retrospective pattern observed when the simulated data are analyzed with VPA, so not all sources of uncertainty have been captured.

There was only one index generated for each age. The catchability for each index was chosen so that catchability increased with age (Table 2). The uncertainty was higher for the indices at younger ages than older ages (Table 2). The coefficients of variation were used to generate lognormally distributed error in the observed indices. The population trends, catchability coefficients, and coefficients of variation combined to produce different probabilities that a given index value would fall below 1.0 (Table 3). Index values below 1.0 were treated in four different ways:

- Case 1 - Actual values used
- Case 2 - Replaced with 0.0 and treated as missing
- Case 3 - Replaced with the arbitrary constant 0.01
- Case 4 - Replaced with 0.0 then a constant of  $1/6$  times the smallest non-zero element in the index vector added to all index vector elements including zeros.

The VPA input files generated for each realization were identical excepting that indices of abundance were altered by case.

The median values of  $F$  and  $N$  at age from the 100 realizations of the VPA model under the four cases of treating index values below 1.0 were compared with the true values from the simulated population (Tables 4-5 and Figs 4-5). Due to the convergence properties of VPA, the medians from the 4 cases are essentially identical for years 1982-1994, as seen in Figures 4-5, and so are not shown in Tables 4-5. The most striking feature seen in the tables and figures is the poor performance of Case 3 (replacing zeros with the arbitrary constant 0.01). The fishing mortality rates in Case 3 were well below the true values while the estimated population abundances were well above the true values. Case 3 clearly demonstrates the potential for introducing bias by replacing zeros in tuning index time series with an arbitrary constant. While not as clear, generally the Case 4 (add  $1/6$  of smallest non-zero element) estimates were more biased than the Case 2 (treat zeros as missing) estimates. The exception to this generality is seen in age 1 results where the VPA formulation had to be modified slightly to estimate only ages 3-8 in the terminal year +1 due to the lack of information for age 2 in the terminal year +1 when the index was zero. For older ages, Case 2 actually outperformed Case 1 (all data used) relative to the truth. It is not clear why this happened and may be an artifact of the bias introduced by the mis-ageing matrix used to generate the catch data. However, even if Case 1 is used as the basis for comparison, instead of the true values, Case 2 performs at least as well as Case 4 for all ages except age 1.

## Discussion

An alternative method to determining the constant to use in place of zeros that was not considered in this exercise is provided by Berry (1987). The Berry approach consists of finding the constant that minimizes a function of the skewness plus kurtosis of the raw data. This

approach is not appropriate for use with tuning index data because the residuals are assumed to follow a lognormal distribution, not the raw observations.

While the 1/6 of the smallest non-zero approach appears to provide reasonable results in some cases, it is an arbitrary rule. In some situations, 1/5 or 1/7 of the smallest non-zero index value would perform better than 1/6. The main problem remains however. Filling zeros with a constant value, no matter how that constant is selected, creates a pattern that may not match reality. These simulations show that this approach can produce results further from the truth than treating zeros as missing values.

Of course, in reality the zeros do have information. Results should be checked to ensure that predicted values are not high when index is zero. If an assessment model predicts high abundance for a year-age combination that had a zero index, the model results should be questioned. However, adding incorrect information arbitrarily has the potential to bias the results, as demonstrated in these simulations.

### **Conclusions**

The two simulation studies have demonstrated problems that can arise when tuning indices with zero values are replaced with arbitrary constants. This practice assumes that the correct magnitude can be chosen to fill the zeros and that it is better to provide the model with information that the index is low rather than treat the data as missing. Results demonstrate that this premise is not always correct. Thus, we recommend the NEFSC standard approach of treating zero values in tuning indices for VPA as missing values.

### **References Cited**

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Table 1. Artificial time series for a population and the associated time series of indices given a catchability of 0.000002 when the values are rounded to two, one, and zero decimal places. Highlighted cells are years when the tuning index has an observed zero.

Year	Population	Index		
		Round 2	Round 1	Round 0
1980	2000000	4.00	4.0	4
1981	1500000	3.00	3.0	3
1982	1300000	2.60	2.6	3
1983	1000000	2.00	2.0	2
1984	500000	1.00	1.0	1
1985	300000	0.60	0.6	1
1986	200000	0.40	0.4	0
1987	10000	0.02	0.0	0
1988	5000	0.01	0.0	0
1989	1000	0.00	0.0	0
1990	2000	0.00	0.0	0
1991	50000	0.10	0.1	0
1992	100000	0.20	0.2	0
1993	300000	0.60	0.6	1
1994	400000	0.80	0.8	1
1995	700000	1.40	1.4	1
1996	1200000	2.40	2.4	2
1997	1500000	3.00	3.0	3
1998	1100000	2.20	2.2	2
1999	1200000	2.40	2.4	2
2000	1700000	3.40	3.4	3

Table 2. Catchability coefficients (q) and coefficients of variation (CV) by age for the tuning indices used in the second study. The q values multiplied the true populations at age to generate the expected values for the indices by year. The CV values describe the amount of lognormally distributed error used to create the random VPA input data.

Param	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8
	0.0000000	0.0000000	0.0000000	0.0000	0.0000	0.0000	0.0000	0.0000
q	3	1	1	1	1	1	1	1
CV	0.5	0.5	0.5	0.3	0.3	0.3	0.3	0.3

Table 3. Probability that an index value will be below 1.0 and thus set to zero given the true population, catchability coefficient, and uncertainty associated with each index and year.

Year	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8
1982	6.9	<1.0	16.4	<1.0	<1.0	6.4	9.5	94.6
1983	4.9	<1.0	2.1	<1.0	<1.0	<1.0	98.5	89.6
1984	28.0	<1.0	4.4	<1.0	<1.0	46.6	>99.0	>99.0
1985	27.8	<1.0	1.2	<1.0	<1.0	<1.0	>99.0	>99.0
1986	21.6	<1.0	10.9	<1.0	<1.0	<1.0	85.8	>99.0
1987	35.5	<1.0	14.0	<1.0	<1.0	<1.0	63.4	>99.0
1988	98.6	1.0	5.8	<1.0	<1.0	<1.0	6.6	>99.0
1989	73.8	64.1	26.5	<1.0	<1.0	<1.0	58.5	>99.0
1990	65.9	11.2	97.6	<1.0	<1.0	1.5	>99.0	>99.0
1991	70.0	6.9	59.9	<1.0	<1.0	0.8	>99.0	>99.0
1992	60.7	8.5	47.8	<1.0	<1.0	1.5	>99.0	>99.0
1993	58.4	4.9	48.1	<1.0	<1.0	84.2	>99.0	>99.0
1994	53.2	3.8	27.8	<1.0	<1.0	<1.0	>99.0	>99.0
1995	45.3	3.2	31.0	<1.0	<1.0	<1.0	92.5	>99.0
1996	70.8	1.9	26.3	<1.0	<1.0	<1.0	64.5	>99.0
1997	68.8	7.9	18.7	<1.0	<1.0	<1.0	51.2	>99.0
1998	64.2	7.3	42.7	<1.0	<1.0	<1.0	36.4	>99.0
1999	69.5	5.3	34.4	<1.0	<1.0	<1.0	10.8	>99.0
2000	53.7	7.0	29.1	<1.0	<1.0	<1.0	1.7	96.7
2001	69.0	2.8	31.7	<1.0	<1.0	<1.0	<1.0	71.5
2002	56.2	6.3	15.0	<1.0	<1.0	<1.0	<1.0	8.4
2003	80.3	2.9	21.5	<1.0	<1.0	<1.0	<1.0	<1.0
2004	55.1	11.4	12.2	<1.0	<1.0	<1.0	<1.0	<1.0
2005	97.5	2.7	31.9	<1.0	<1.0	<1.0	<1.0	<1.0
2006	97.5	46.6	12.4	<1.0	<1.0	<1.0	<1.0	<1.0

Table 4. Comparison of true fishing mortality at age with medians from 100 realizations under the four cases of treating index values less than 1.0.

Age	Year	F at Age					Percent bias in Medians vs Truth			
		True	Case 1	Case 2	Case 3	Case 4	Case 1	Case 2	Case 3	Case 4
1	1995	0.084	0.084	0.084	0.082	0.084	0	0	-3	0
1	1996	0.079	0.078	0.078	0.073	0.078	-1	-1	-7	-1
1	1997	0.085	0.082	0.082	0.073	0.082	-3	-3	-14	-3
1	1998	0.066	0.065	0.066	0.049	0.064	-1	0	-25	-3
1	1999	0.067	0.064	0.065	0.039	0.061	-5	-3	-42	-9
1	2000	0.060	0.058	0.060	0.031	0.055	-3	0	-49	-8
1	2001	0.046	0.044	0.045	0.038	0.044	-3	-1	-17	-3
1	2002	0.033	0.031	0.032	0.026	0.032	-4	-3	-20	-3
1	2003	0.032	0.031	0.031	0.029	0.032	-1	-2	-10	0
1	2004	0.032	0.031	0.033	0.025	0.029	-3	3	-21	-10
1	2005	0.036	0.030	0.024	0.057	0.034	-16	-34	59	-5
2	1995	0.378	0.380	0.381	0.377	0.380	1	1	0	1
2	1996	0.356	0.370	0.370	0.361	0.369	4	4	1	4
2	1997	0.380	0.385	0.385	0.358	0.382	1	1	-6	1
2	1998	0.299	0.299	0.301	0.256	0.297	0	1	-14	-1
2	1999	0.306	0.305	0.308	0.223	0.298	0	1	-27	-3
2	2000	0.272	0.266	0.270	0.155	0.253	-2	-1	-43	-7
2	2001	0.210	0.208	0.213	0.104	0.196	-1	1	-51	-7
2	2002	0.151	0.150	0.151	0.129	0.150	-1	0	-15	-1
2	2003	0.147	0.144	0.146	0.119	0.142	-2	0	-19	-3
2	2004	0.147	0.152	0.151	0.137	0.154	3	3	-6	5
2	2005	0.167	0.170	0.173	0.135	0.156	2	4	-19	-6
3	1995	0.730	0.709	0.710	0.705	0.709	-3	-3	-3	-3
3	1996	0.688	0.669	0.669	0.657	0.668	-3	-3	-4	-3
3	1997	0.737	0.732	0.733	0.700	0.729	-1	-1	-5	-1
3	1998	0.578	0.562	0.564	0.502	0.558	-3	-2	-13	-3
3	1999	0.597	0.573	0.577	0.457	0.563	-4	-3	-23	-6
3	2000	0.529	0.506	0.509	0.329	0.486	-4	-4	-38	-8
3	2001	0.410	0.378	0.388	0.188	0.357	-8	-5	-54	-13
3	2002	0.297	0.281	0.295	0.124	0.261	-5	-1	-58	-12
3	2003	0.289	0.275	0.278	0.227	0.275	-5	-4	-22	-5
3	2004	0.290	0.287	0.284	0.226	0.277	-1	-2	-22	-4
3	2005	0.329	0.336	0.335	0.291	0.338	2	2	-11	3
4	1995	0.973	0.913	0.913	0.909	0.913	-6	-6	-7	-6
4	1996	0.913	0.848	0.849	0.836	0.848	-7	-7	-8	-7
4	1997	0.980	0.910	0.911	0.877	0.908	-7	-7	-11	-7
4	1998	0.765	0.726	0.727	0.662	0.721	-5	-5	-13	-6
4	1999	0.790	0.725	0.729	0.595	0.714	-8	-8	-25	-10
4	2000	0.701	0.637	0.643	0.431	0.617	-9	-8	-39	-12
4	2001	0.542	0.488	0.499	0.262	0.465	-10	-8	-52	-14
4	2002	0.390	0.337	0.351	0.138	0.310	-14	-10	-65	-21
4	2003	0.381	0.340	0.361	0.125	0.308	-11	-5	-67	-19
4	2004	0.383	0.349	0.355	0.271	0.351	-9	-7	-29	-8

4	2005	0.435	0.410	0.408	0.303	0.392	-6	-6	-30	-10
5	1995	1.110	1.051	1.051	1.046	1.051	-5	-5	-6	-5
5	1996	1.041	0.974	0.975	0.960	0.973	-6	-6	-8	-7
5	1997	1.115	1.041	1.042	1.004	1.038	-7	-7	-10	-7
5	1998	0.870	0.820	0.822	0.750	0.814	-6	-5	-14	-6
5	1999	0.894	0.849	0.855	0.710	0.838	-5	-4	-21	-6
5	2000	0.793	0.730	0.737	0.502	0.706	-8	-7	-37	-11
5	2001	0.611	0.548	0.564	0.292	0.522	-10	-8	-52	-15
5	2002	0.438	0.390	0.407	0.166	0.361	-11	-7	-62	-18
5	2003	0.427	0.374	0.396	0.122	0.333	-12	-7	-71	-22
5	2004	0.429	0.375	0.405	0.108	0.328	-13	-6	-75	-23
5	2005	0.488	0.449	0.453	0.312	0.442	-8	-7	-36	-9
6	1995	1.177	1.133	1.133	1.128	1.133	-4	-4	-4	-4
6	1996	1.106	1.028	1.028	1.017	1.027	-7	-7	-8	-7
6	1997	1.185	1.107	1.107	1.069	1.102	-7	-7	-10	-7
6	1998	0.923	0.848	0.851	0.777	0.844	-8	-8	-16	-8
6	1999	0.947	0.867	0.875	0.727	0.856	-8	-8	-23	-10
6	2000	0.838	0.778	0.788	0.535	0.742	-7	-6	-36	-11
6	2001	0.644	0.573	0.591	0.308	0.542	-11	-8	-52	-16
6	2002	0.461	0.400	0.415	0.169	0.370	-13	-10	-63	-20
6	2003	0.447	0.385	0.403	0.126	0.341	-14	-10	-72	-24
6	2004	0.449	0.374	0.413	0.093	0.319	-17	-8	-79	-29
6	2005	0.511	0.424	0.474	0.090	0.350	-17	-7	-82	-32
7	1995	1.209	1.133	1.133	1.128	1.133	-6	-6	-7	-6
7	1996	1.136	1.028	1.028	1.017	1.027	-10	-10	-10	-10
7	1997	1.218	1.107	1.107	1.069	1.102	-9	-9	-12	-10
7	1998	0.948	0.848	0.851	0.777	0.844	-11	-10	-18	-11
7	1999	0.971	0.867	0.875	0.727	0.856	-11	-10	-25	-12
7	2000	0.859	0.778	0.788	0.535	0.742	-9	-8	-38	-14
7	2001	0.660	0.573	0.591	0.308	0.542	-13	-10	-53	-18
7	2002	0.471	0.400	0.415	0.169	0.370	-15	-12	-64	-21
7	2003	0.456	0.385	0.403	0.126	0.341	-16	-12	-72	-25
7	2004	0.458	0.374	0.413	0.093	0.319	-18	-10	-80	-30
7	2005	0.520	0.490	0.503	0.369	0.474	-6	-3	-29	-9
8	1995	1.227	1.133	1.133	1.128	1.133	-8	-8	-8	-8
8	1996	1.150	1.028	1.028	1.017	1.027	-11	-11	-12	-11
8	1997	1.234	1.107	1.107	1.069	1.102	-10	-10	-13	-11
8	1998	0.961	0.848	0.851	0.777	0.844	-12	-11	-19	-12
8	1999	0.984	0.867	0.875	0.727	0.856	-12	-11	-26	-13
8	2000	0.870	0.778	0.788	0.535	0.742	-11	-9	-38	-15
8	2001	0.667	0.573	0.591	0.308	0.542	-14	-11	-54	-19
8	2002	0.476	0.400	0.415	0.169	0.370	-16	-13	-64	-22
8	2003	0.461	0.385	0.403	0.126	0.341	-17	-12	-73	-26
8	2004	0.462	0.374	0.413	0.093	0.319	-19	-11	-80	-31
8	2005	0.525	0.490	0.503	0.369	0.474	-7	-4	-30	-10

Table 5. Comparison of true population numbers at age (thousands) with medians from 100 realizations under the four cases of treating index values less than 1.0.

Age	Year	F at Age					Percent bias in Medians vs Truth			
		True	Case 1	Case 2	Case 3	Case 4	Case 1	Case 2	Case 3	Case 4
1	1995	35236	35204	35180	35943	35249	0	0	2	0
1	1996	25724	26354	26310	27872	26458	2	2	8	3
1	1997	26449	26916	26811	30592	27112	2	1	16	3
1	1998	28054	28554	28367	36913	29142	2	1	32	4
1	1999	26207	27566	27102	44094	28562	5	3	68	9
1	2000	31907	32711	31866	61032	34452	3	0	91	8
1	2001	26383	27216	27231	31739	27606	3	3	20	5
1	2002	30976	31174	31460	37429	31911	1	2	21	3
1	2003	22272	21688	22217	24795	21886	-3	0	11	-2
1	2004	31379	31477	30866	38880	33836	0	-2	24	8
1	2005	13176	14426	20116	8650	13929	9	53	-34	6
1	2006	13176	13461	27312	3659	11610	2	107	-72	-12
2	1995	24025	24166	24162	24367	24182	1	1	1	1
2	1996	26523	26475	26454	27088	26520	0	0	2	0
2	1997	19463	19941	19918	21154	20006	2	2	9	3
2	1998	19900	20228	20157	23206	20440	2	1	17	3
2	1999	21504	21908	21761	28759	22399	2	1	34	4
2	2000	20057	21123	20803	34764	22028	5	4	73	10
2	2001	24611	25247	24559	48407	26662	3	0	97	8
2	2002	20634	21314	21398	24997	21670	3	4	21	5
2	2003	24546	24731	24986	29795	25386	1	2	21	3
2	2004	17667	17198	17604	19741	17318	-3	0	12	-2
2	2005	24890	24958	24448	31007	26906	0	-2	25	8
2	2006	10407	11427	16081	6674	11061	10	55	-36	6
3	1995	12645	12600	12599	12651	12604	0	0	0	0
3	1996	13490	13521	13517	13659	13529	0	0	1	0
3	1997	15224	14967	14959	15492	15024	-2	-2	2	-1
3	1998	10904	11082	11050	12111	11133	2	1	11	2
3	1999	12087	12282	12214	14715	12447	2	1	22	3
3	2000	12966	13234	13057	18672	13585	2	1	44	5
3	2001	12517	13289	12992	24479	13977	6	4	96	12
3	2002	16330	16799	16227	35675	17965	3	-1	118	10
3	2003	14523	15014	15026	17976	15280	3	3	24	5
3	2004	17356	17479	17544	21764	18001	1	1	25	4
3	2005	12489	12140	12403	14081	12114	-3	-1	13	-3
3	2006	17254	17285	16870	22139	18867	0	-2	28	9
4	1995	4938	4959	4959	4970	4960	0	0	1	0
4	1996	5000	5099	5100	5141	5102	2	2	3	2
4	1997	5559	5670	5668	5796	5677	2	2	4	2
4	1998	5974	5904	5899	6279	5933	-1	-1	5	-1
4	1999	5015	5191	5169	5967	5241	4	3	19	5
4	2000	5454	5672	5621	7670	5803	4	3	41	6
4	2001	6259	6555	6417	11078	6850	5	3	77	9
4	2002	6802	7408	7157	16538	7980	9	5	143	17
4	2003	9941	10365	9909	25846	11260	4	0	160	13
4	2004	8905	9327	9348	11763	9506	5	5	32	7

4	2005	10635	10737	10873	14259	11289	1	2	34	6
4	2006	7361	7048	7273	8649	7071	-4	-1	17	-4
5	1995	1354	1488	1488	1490	1488	10	10	10	10
5	1996	1529	1639	1639	1649	1640	7	7	8	7
5	1997	1645	1772	1771	1809	1775	8	8	10	8
5	1998	1710	1867	1865	1977	1875	9	9	16	10
5	1999	2277	2343	2335	2659	2368	3	3	17	4
5	2000	1865	2047	2037	2688	2098	10	9	44	12
5	2001	2216	2451	2418	4064	2576	11	9	83	16
5	2002	2982	3290	3203	6966	3519	10	7	134	18
5	2003	3770	4345	4133	11817	4791	15	10	213	27
5	2004	5560	6003	5660	18664	6770	8	2	236	22
5	2005	4971	5379	5373	7295	5482	8	8	47	10
5	2006	5636	5852	5934	8603	6258	4	5	53	11
6	1995	355	394	394	395	394	11	11	11	11
6	1996	366	427	427	429	427	17	17	17	17
6	1997	442	505	505	515	506	14	14	16	14
6	1998	442	510	509	542	512	15	15	23	16
6	1999	587	679	676	760	684	16	15	30	16
6	2000	762	815	808	1076	833	7	6	41	9
6	2001	691	812	798	1342	852	17	16	94	23
6	2002	985	1157	1136	2464	1258	18	15	150	28
6	2003	1575	1825	1750	4824	2010	16	11	206	28
6	2004	2014	2445	2271	8516	2823	21	13	323	40
6	2005	2964	3397	3073	13723	3991	15	4	363	35
6	2006	2498	2812	2784	4372	2903	13	11	75	16
7	1995	66	83	83	83	83	27	27	27	27
7	1996	90	106	106	106	106	18	18	19	18
7	1997	99	122	122	125	122	23	23	26	24
7	1998	111	135	135	145	136	22	22	31	23
7	1999	144	180	179	201	181	25	25	40	26
7	2000	186	232	230	305	237	24	23	64	27
7	2001	270	307	303	514	322	14	12	90	19
7	2002	297	369	358	804	405	24	20	171	36
7	2003	509	633	609	1692	703	24	20	233	38
7	2004	825	1010	963	3467	1175	23	17	320	42
7	2005	1053	1376	1234	6359	1679	31	17	504	60
7	2006	1456	1809	1562	10263	2309	24	7	605	59
8	1995	9	13	13	13	13	48	48	48	48
8	1996	18	24	24	24	24	34	33	34	34
8	1997	28	36	36	36	36	27	27	29	27
8	1998	31	41	41	44	41	34	34	42	35
8	1999	45	60	59	68	60	33	32	52	34
8	2000	58	73	73	95	75	26	25	64	29
8	2001	85	110	108	182	113	30	28	115	34
8	2002	150	184	180	388	198	23	20	159	32
8	2003	228	287	277	803	321	26	22	252	41
8	2004	382	487	456	1705	559	28	19	347	46
8	2005	624	690	666	845	710	11	7	35	14
8	2006	814	1057	937	14806	997	30	15	1718	22



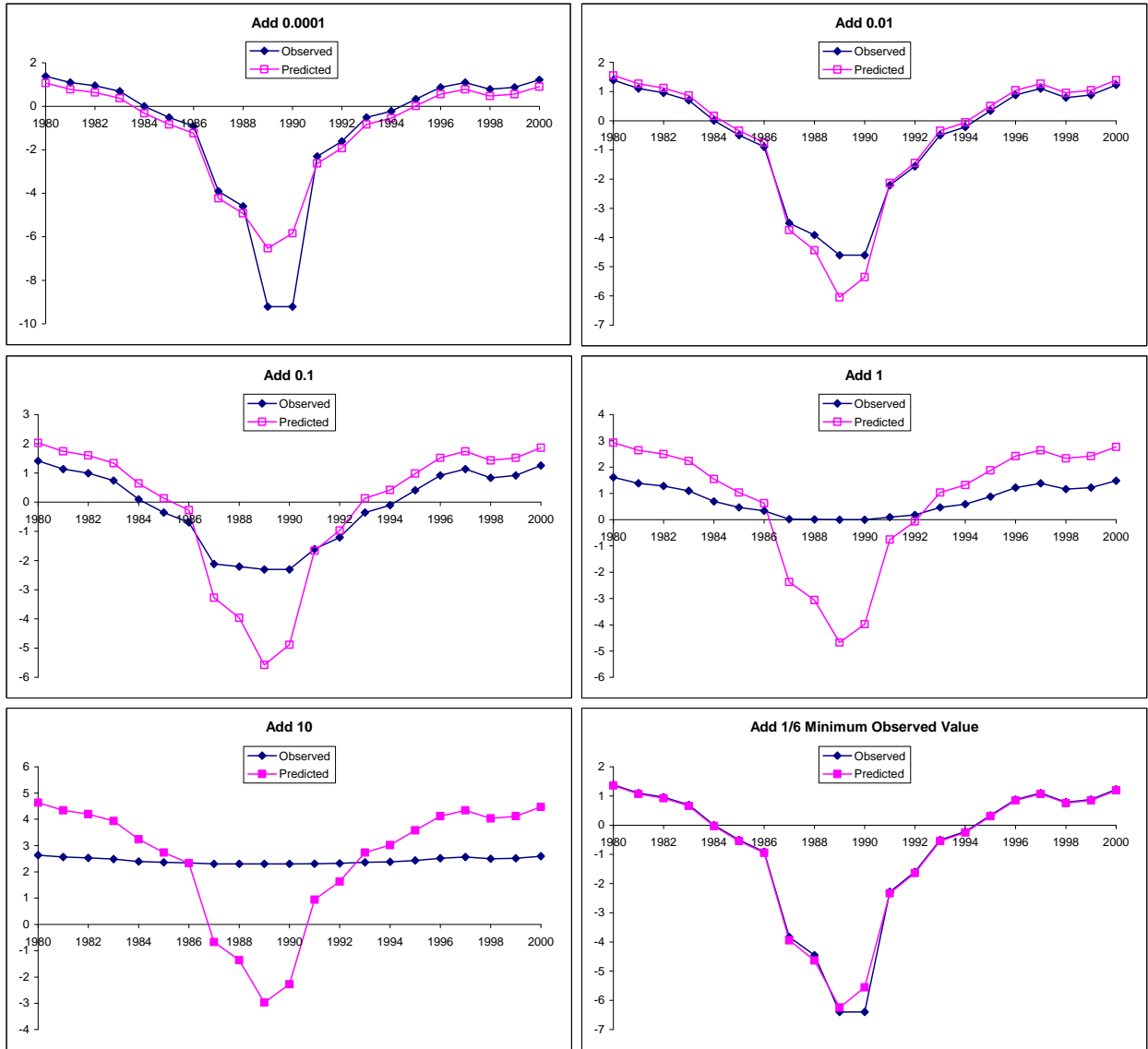


Figure 1. Comparison of observed and predicted indices when observed values are rounded to two decimal places and resulting zeros are replaced by different constants. The predicted indices follow the true population pattern and are scaled by a catchability coefficient to minimize the natural logarithm of the squared residuals. Note the y-axes are log scale.

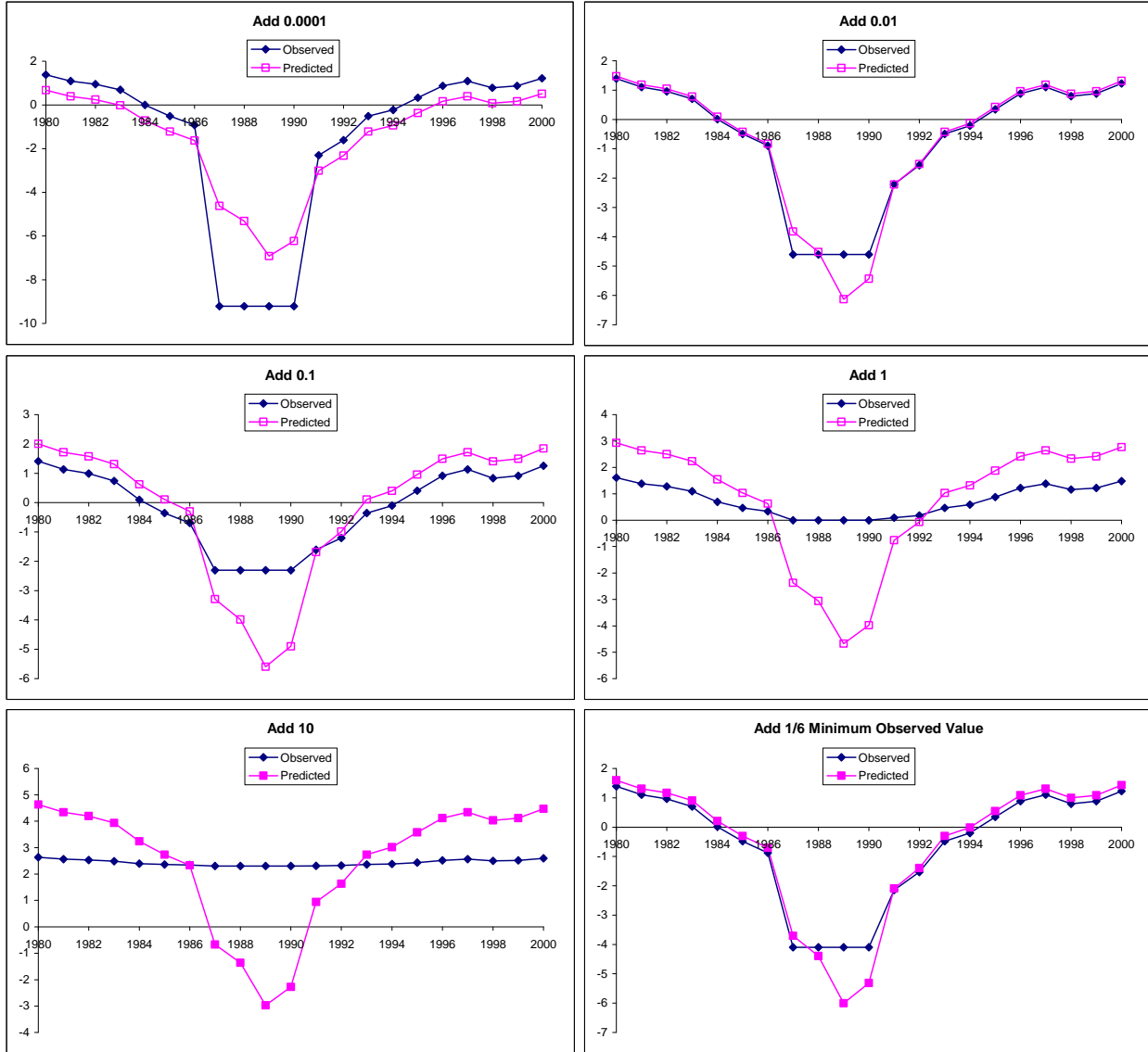


Figure 2. Comparison of observed and predicted indices when observed values are rounded to one decimal place and resulting zeros are replaced by different constants. The predicted indices follow the true population pattern and are scaled by a catchability coefficient to minimize the natural logarithm of the squared residuals. Note the y-axes are log scale.

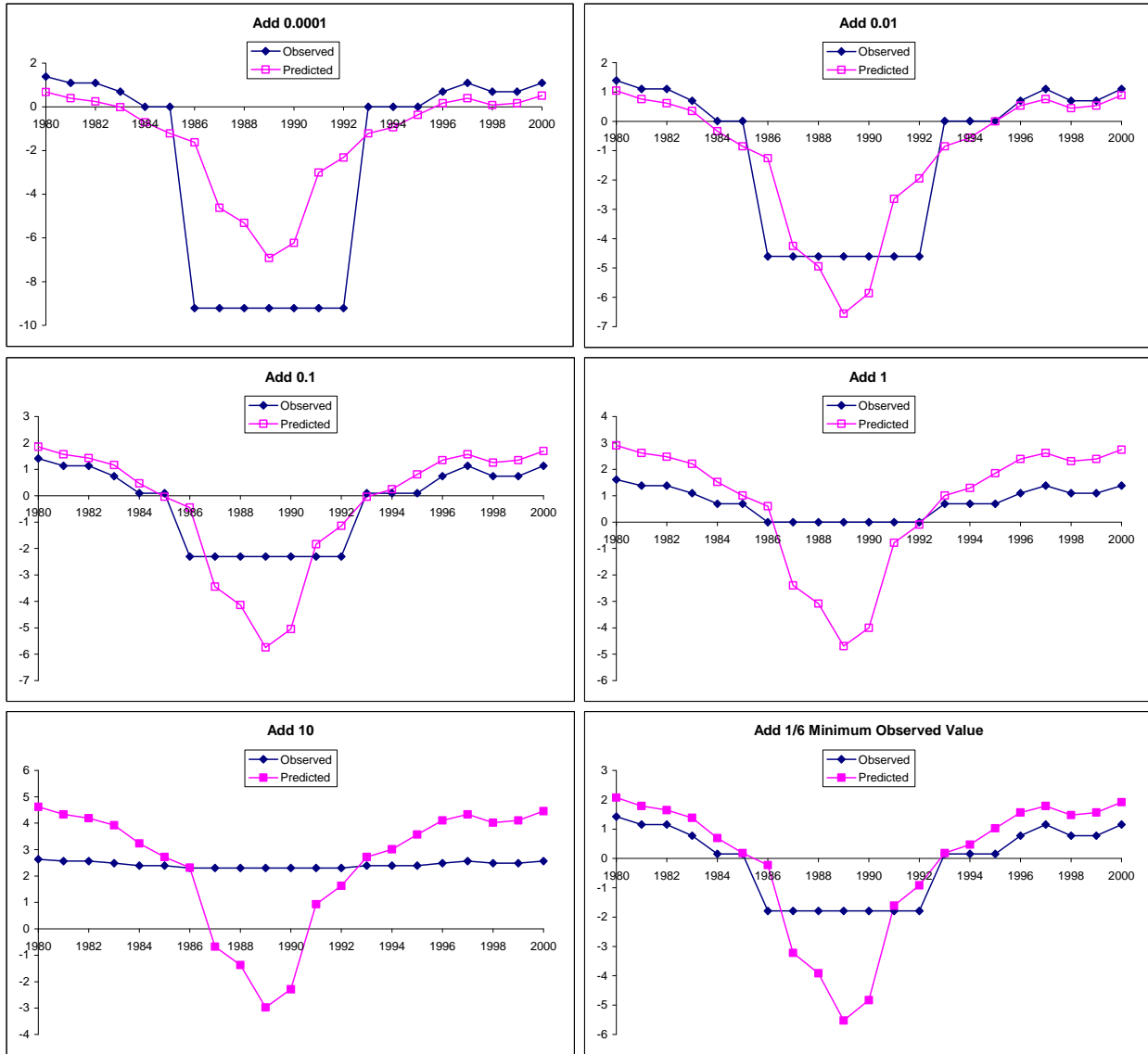


Figure 3. Comparison of observed and predicted indices when observed values are rounded to zero decimal places and resulting zeros are replaced by different constants. The predicted indices follow the true population pattern and are scaled by a catchability coefficient to minimize the natural logarithm of the squared residuals. Note the y-axes are log scale

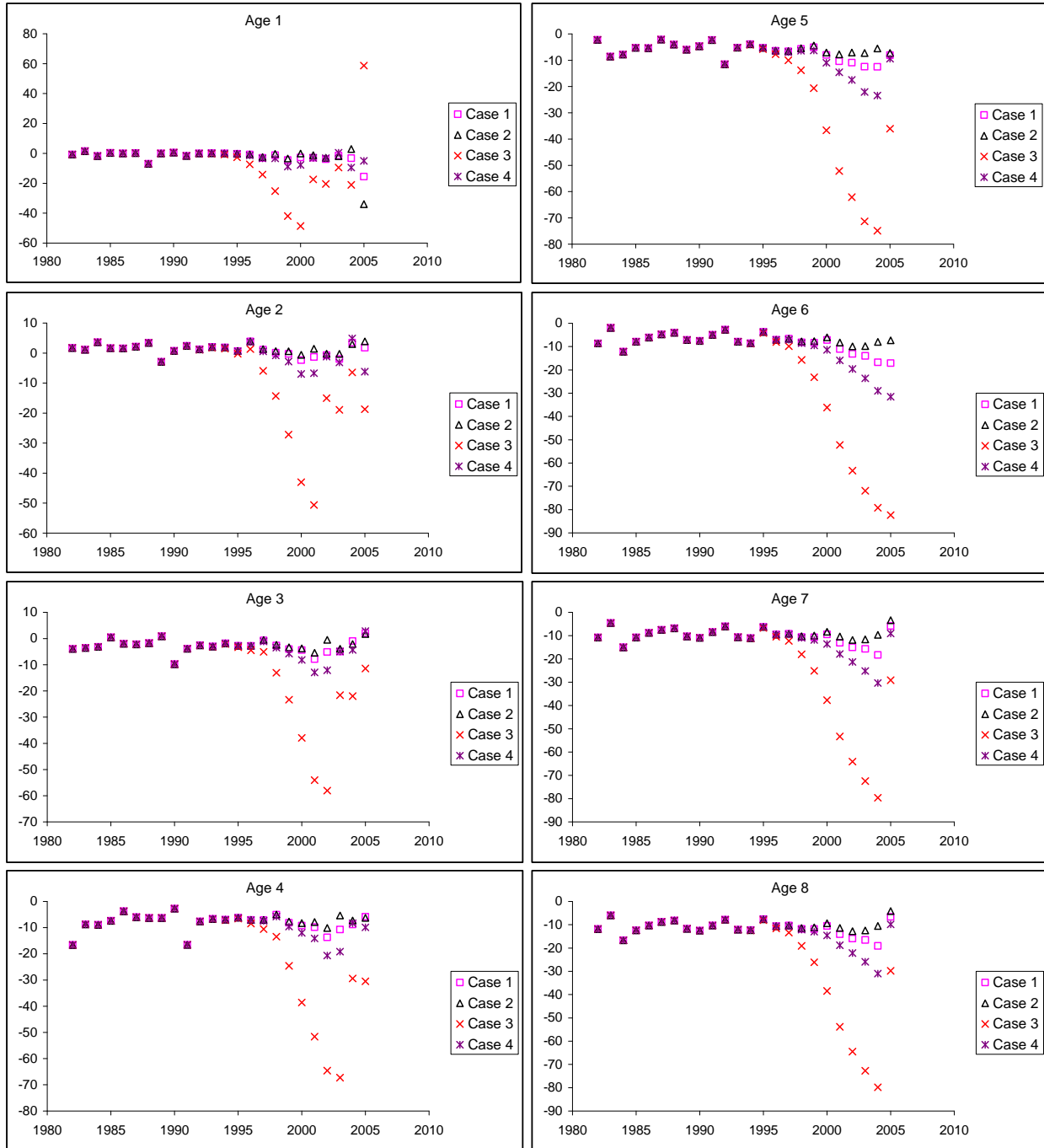


Figure 4. Percent bias in the medians of fishing mortality by age and year for the four cases of how index values less than one are treated

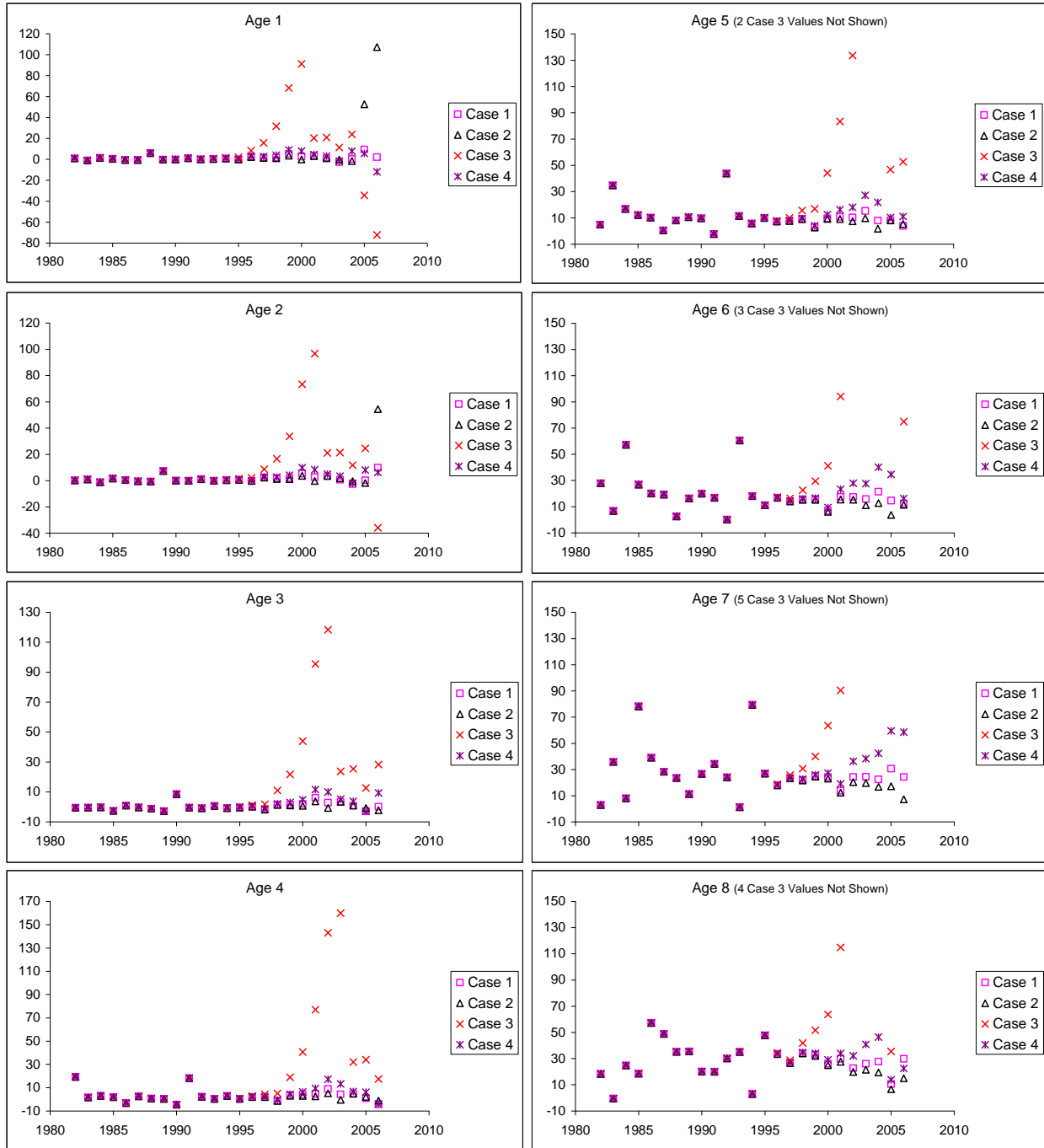


Figure 5. Percent bias in the medians of population numbers by age and year for the four cases of how index values less than one are treated. Note a number of case 3 values are too large to be shown on the plots, values are given in Table 5.

**Some More Thoughts on Filling Zeros in Tuning Indices:  
A Simple Regression Example**

by  
Chris Legault

**Introduction**

The problem of zeros in tuning indices is that a lognormal error distribution is assumed. Since the logarithm of zero is undefined these zero tuning indices must be either treated as missing data or else be replaced by a positive value. One objective method to do this is to add 1/6 of the smallest non-zero value in the series to all values. The consequences of these two approaches are considered in a simple regression example.

**Methods**

A 26 year population time series was simulated with each value varying uniformly between zero and 50,000 fish. A catchability coefficient of 0.0001 was applied to generate the predicted index value. Lognormal noise with  $\exp(\text{std dev})$  of 0.2 was applied to the predicted values to generate the observed indices. If an observed index was below 0.5, then it was set to zero to mimic the problem of low abundance not being detected. The constant  $c$  was determined for each realization as 1/6 of the smallest non-zero value in the observed time series. Four time series of values were created,  $\ln(\text{obs})$ ,  $\ln(\text{obs}+c)$ ,  $\ln(\text{pred})$ , and  $\ln(\text{pred}+c)$  where  $\ln(\text{obs})$  was missing when the observed value was zero. Two slopes were computed, one for  $\ln(\text{obs})$  vs  $\ln(\text{pred})$  denoted “missing” and the other for  $\ln(\text{obs}+c)$  vs  $\ln(\text{pred}+c)$  denoted “add  $c$ .” Since in both cases the only source of error is the lognormal error assumed around the observed values, the expectation is that both lines will have slope equal to one. Random series of populations and observation errors were drawn 10,000 times and the two slopes computed for each realization.

**Results**

When zero observations were treated as missing, the slope was slightly negatively biased with mean 0.983 and 90% confidence interval (0.864, 1.109). When a constant of 1/6 the smallest non-zero value was added to all observed and predicted values, the slope was highly positively biased with mean 1.261 and 90% confidence interval (1.018, 1.483). Note that the 90% confidence interval for the “add  $c$ ” case does not overlap one and has a range nearly twice as large as the “missing” case.

## Discussion

The reason for this large disparity between the “missing” and “add c” results can be seen by examining an extreme example of the data used in the regressions (Figure 1). There were five observations that were replaced with  $c=0.094$  causing the five  $\ln(\text{obs}+c)$  values to all be  $-2.364$  even though the associated  $\ln(\text{pred}+c)$  values ranged from  $-1.265$  to  $-0.307$ . These points do not fall on the line that would have been fit to the remaining data and are the source of the bias in the results. More typical results followed the same pattern but with less difference between the two slopes.

The constant was added to both observed and predicted data because to ensure an appropriate comparison. In a separate simulation I did not replace values less than 0.5 with zero and found nearly identical distributions for the “missing” and “add c” slopes. This demonstrates that filling of zeros causes the problem, not the addition of a constant.

In order for the “add c” approach to be unbiased, the constant would have to be selected for each realization such that the average of the  $\ln(\text{pred}+c)$  was the same as  $\ln(\text{obs}+c)$  for the values when  $\text{obs}=0$ . This cannot happen because the predicted values are positive while the observed values are by definition set to zero. Thus, adding a constant to all values when a zero is in the time series will always bias the results.

## Conclusion

Filling observed zeros in tuning indices causes a bias relative to the true population that is much greater than the bias introduced by treating the zeros as missing in this simple regression example.

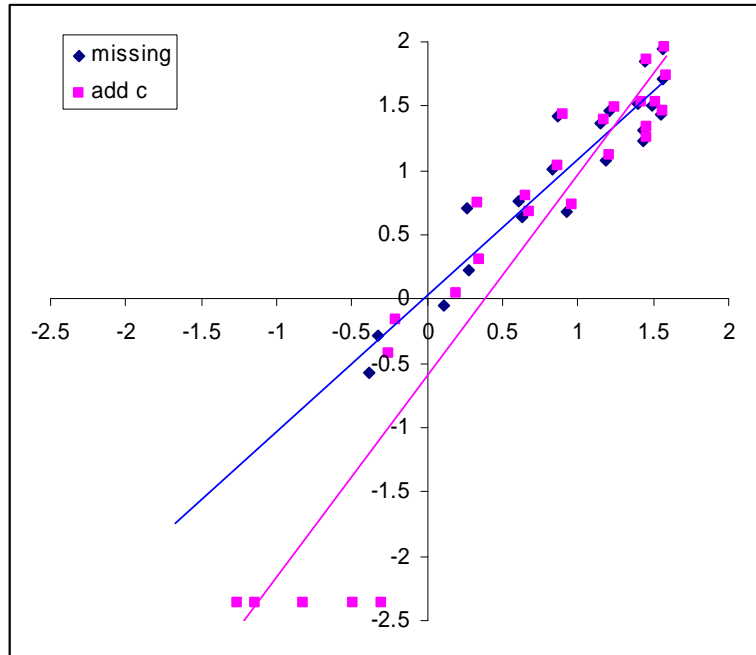


Figure 1. One realization of the “missing” and “add c” regressions. This example is extreme with “add c” slope slightly larger than the upper 90% confidence interval. The x-axis is either  $\ln(\text{pred})$  or  $\ln(\text{pred}+c)$  and the y-axis is either  $\ln(\text{obs})$  or  $\ln(\text{obs}+c)$ .



**The treatment of “zero” observations  
in the Summer Flounder ADAPT VPA calibration**

by  
Mark Terceiro

**Introduction**

The issue of how to treat “zero” observations in ADAPT VPA calibrations was addressed in a previous Southern Demersal Working Group (SDWG) working paper used in preparing the 2004 summer flounder assessment (SDWG 2003; beginning on page 8). That work responded to the 2002 SAW 35 (NEFSC 2002) summer flounder assessment Research Recommendation: *Explore the sensitivity of the VPA calibration to the addition of 1 and/or a small constant to values of survey series with “true zeros.”* This recommendation stemmed from the nature of the ADAPT VPA calibration (tuning) algorithm, which includes natural logarithm (ln) transformation (i.e., assumption of a lognormal error distribution) of the input survey abundance indices prior to calibration. Some of the tuning series in the assessment include several “true zero” observations (as contrasted with years for which no sampling was performed) in their time series. Since “zeros” are treated as missing values in the ADAPT computations, a possible solution would be to add a constant to every value in these series to enable use of these “true zeros” as observations.

In the 2002 (NEFSC 2002) and 2003 (Terceiro 2003a) summer flounder assessments, the addition of the constant value of 1 was made for five age 0 recruitment indices: the MA DMF Seine, CT DEP fall trawl, RI DFW fall trawl, RI DFW monthly trawl, and DE DFW 16 foot bay trawl survey series (note that the latter series was not included in the final ADAPT VPA tuning configuration). No constant was added to survey series with “zero” observations for other age classes. The choice of the value of 1 as the additive constant was based on recommendations from statistical texts (e.g., Snedecor and Cochran 1967, Sokal and Rohlf 1981) for the ln-transformation of data.

Berry (1987) provides guidance on the objective selection of the appropriate value of the additive constant based on the statistical properties (skewness and kurtosis) of data series to be ln-transformed. Briefly, the method consists of 1) addition of a range of constants from very large (e.g., 100) to very small (e.g., 0.0001) to the original values in the series, 2) ln-transformation of the modified series, 3) calculation of the skewness and kurtosis of the modified series, and 4) summation of the absolute value of the skewness and kurtosis (providing the statistic  $g$ ) of the modified series. The additive constant that minimizes  $g$  for a given series of data is the one that best minimizes the effect of outliers and normalizes residuals from the lognormal error distribution, hence best adhering to the assumption of the lognormal distribution. Work using the procedures suggested by Berry (1987) with recreational fishery catch rates as indices of abundance indicated that the additive constant of 1 was an appropriate value for those

data, typically with values between zero and 50 (Terceiro 2003b).

The SDWG (2003) work applied the method suggested by Berry (1987) to summer flounder age 0 surveys with “zero” observations. Of the five age 0 series with “zero” observations, the MA DMF series varies between 0 and 70, while the other four series contained small values that varied between 0 and 1. The 2003 work (SDWG 2003) found that for the MA DMF series, the additive constant of 1 minimized the value of  $g$ . For the other four series,  $g$  was minimized by small values of the additive constant ranging from 0.001 to 0.1, with an “average” best additive constant of 0.1. The SDWG (2003) therefore recommended use of the revised, varying (1 or 0.1) additive constants in future assessments, and this revision was made in the 2004-2006 assessment, for age 0 survey series only. No constant was added for survey series of other age classes, pending further research.

Recently, the 2006 assessment of summer flounder (Terceiro 2006a) was subject to a NMFS Office of Science and Technology (S&T) Peer Review (Methot 2006). Among the recommendations made by the S&T Peer Review panel was the following:

*The Panel finds that one immediate modification of the VPA is justifiable and reduces the retrospective pattern in stock size during 2003-2005. The VPA model currently treats survey observations of zero as missing values. An observation of zero for a particular age of fish in a particular survey year does not mean that there are no fish of that age in the stock, only that the number of survey samples was not sufficient to detect any fish of that age. This VPA model, as with most assessment models, tunes to the logarithm of the survey observations so cannot explicitly deal with observations of zero. However, treating these zeroes as missing values can result in a bias because time periods of low abundance are underrepresented in the data input to the assessment model. In the case of summer flounder, the result may be an underestimate of the degree to which the stock has rebuilt since the low levels that occurred around 1990. The committee did not discuss this issue during the Sept 14-15 meeting, so is not prepared to present a definitive solution. An interim approach would use a small value in place of the zeroes. A value equal to one sixth of the smallest observed positive value would be reasonable until a more complete statistical solution can be developed.*

As a result, a revised 2006 ADAPT VPA for summer flounder was developed for which the previous treatment of “zero” observations for age 0 indices was retained (additive constant of 1 for MA DMF seine survey, 0.1 for the CT DEP fall trawl, RI DFW fall trawl, RI DFW monthly trawl, and DE DFW 16 foot bay trawl surveys). For ages 1-7+ survey series with “zero” observations, a value equal to one-sixth of the minimum value in each series was used in place of the “zero” observations. Typically, the minimum non-zero value in these series was 0.01, and so the additive constant was 0.001667 (Terceiro 2006b).

### **Summer flounder 2006 ADAPT VPA**

In this work, the Berry (1987) approach is applied to the summer flounder survey series for all ages with observed “zeros” to determine the best additive constant to use to remove these “zero” observations from the ADAPT VPA calibration data. Table 1 summarizes the statistical properties of the 24 survey series that were examined. The distributions of the surveys are characterized by non-zero values between 0.001 and 70, CVs that generally exceed 100%, positive skewness (long right hand tail), and significant kurtosis (high degree of peak, or contagion, near the mean). The proportion of “zeros” in the time series ranged from 1 of 31 = 3% (NEFSC Spring Age 3 index) to 13 of 28 = 46% (MA Fall 4).

Table 2 summarizes the results of the exercise for each group of age-specific indices. Values of  $g$  were minimized for constants between 0.001 and 100 (minimum values in ***bold italics***), for the age 0, 1, 2, 3, 4, and 5-7+ (aggregate) survey indices (number per tow or haul). There is no statistically significant correlation (Table 3) between the value of the additive constant that minimizes  $g$  and the statistical parameters listed in Table 1.

#### **Age 0 Indices**

For the five age 0 series, the  $g$  statistic was minimized by values of the additive constant ranging from 0.001667 to 1. The constant equated to one-sixth of the minimum non-zero observed value for 2 of the 5 series. The relationships between the additive constants and calculated values of  $g$  for the age 0 indices are shown in Figure 1.

#### **Age 1 Indices**

For the three age 1 series, the additive constant of 0.01 minimized the absolute value of  $g$ . The relationships between the additive constants and calculated values of  $g$  for the age 1 indices are shown in Figure 2.

#### **Age 2 Indices**

For the single age 2 series, the additive constant of 0.1 minimized the absolute value of  $g$ . The relationships between the additive constants and calculated values of  $g$  for the age 2 indices are shown in Figure 3.

#### **Age 3 Indices**

For the six age 3 series, the absolute value of the  $g$  statistic was minimized by values of the additive constant ranging from 0.001 to 100. The constant equated to one-sixth of the minimum non-zero observed value for 1 of the 6 series. The relationships between the additive constants and calculated values of  $g$  for the age 3 indices are shown in Figure 4.

#### **Age 4 Indices**

For the six age 4 series, the absolute value of the  $g$  statistic was minimized by values of the additive constant ranging from 0.001 to 1. The constant equated to one-sixth of the minimum non-zero observed value for 1 of the 6 series. The relationships between the additive constants and calculated values of  $g$  for the age 4 indices are shown in Figure 5.

#### **Age 4/5-7+ Indices**

For the three age 4/5-7+ series, the absolute value of the  $g$  statistic was minimized by values of the additive constant ranging from 0.001667 to 100. The constant equated to one-sixth of the minimum non-zero observed value for 1 of the 3 series. The relationships between the additive constants and calculated values of  $g$  for the age 4/5-7+ indices are shown in Figure 6.

### **Conclusion**

There is no consistent pattern in the identification of the additive constant that minimizes the absolute value of Berry's (1987)  $g$  statistic. There is no strong relationship between the absolute magnitude of the index values, the length of the time series, the number of zeros, the magnitude of the smallest observed value, or any of the usual statistical moments of the series (mean, maximum, non-zero minimum, CV, skewness, kurtosis), and the value of the additive

constant that minimizes  $g$ . Further, while the “one-sixth” of the minimum observed value was identified as the “best” additive constant in 5 of the 24 (21%) cases examined, this level is not high enough to justify this approach as a reliable rule-of-thumb. In fact, the additive constant of 0.01 was identified as “best” for a higher percentage of series (6 of 24 = 25%). Given the inability to identify a constant that consistently minimizes  $g$ , the best rule is to maintain the current approach of making no adjustment and continue to treat “zero” observations as “missing.”

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Table 1 . Statistical properties of summer flounder ADAPT VPA survey calibration series with “zero” observations.

Survey Name	N Obs	N “Zeros”	Mean	Max	Non-zero Min	CV (%)	Skew	Kurt
<b>Age 0 Indices</b>								
RI Fall 0	26	2	0.130	0.550	0.01	118	1.422	1.212
RI Monthly 0	16	3	0.037	0.110	0.01	95	1.044	0.152
CT Fall 0	22	4	0.085	0.442	0.013	128	2.078	4.733
MA Seine 0	24	3	8.292	70.000	1	170	3.904	17.141
DE 30 0	15	1	0.487	2.280	0.02	133	1.874	3.463
<b>Age 1 Indices</b>								
MA Spring 1	28	2	0.260	1.770	0.025	140	3.105	11.161
MA Fall 1	28	2	0.761	2.907	0.011	109	1.280	0.686
RI Fall 1	26	1	0.535	2.470	0.05	120	2.197	4.724
<b>Age 2 Indices</b>								
MA Fall 2	28	2	0.759	2.235	0.047	85	0.884	-0.224
<b>Age 3 Indices</b>								
NEC Spring 3	31	1	0.302	1.020	0.01	99	0.865	-0.536
NEC Fall 3	24	2	0.168	0.660	0.01	111	1.076	0.334
MA Fall 3	28	2	0.132	0.756	0.010	132	2.086	5.191
RI Monthly 3	16	2	0.199	0.530	0.01	95	0.786	-0.916
NJ Trawl 3	18	3	0.340	1.280	0.01	112	1.141	0.828
DE 30 3	15	2	0.155	0.470	0.01	105	0.991	-0.137
<b>Age 4 Indices</b>								
NEC Spring 4	31	5	0.092	0.310	0.01	111	0.985	-0.404
NEC Fall 4	24	8	0.043	0.190	0.01	144	1.444	0.762
MA Spring 4	28	5	0.086	0.317	0.010	116	1.187	0.242
MA Fall 4	28	13	0.019	0.186	0.01	196	3.484	14.026
RI Fall 4	26	5	0.035	0.280	0.01	179	2.961	9.516
RI Monthly 4	16	4	0.060	0.240	0.01	122	1.257	0.856
<b>Age 5-7+ Indices</b>								
NEFSC Spring 5-7+	31	10	0.060	0.210	0.01	121	0.892	-0.793
NEFSC Winter 5-7+	15	1	0.803	2.600	0.01	106	0.698	-0.636
NJ Trawl 4-7+	18	4	0.172	0.810	0.01	129	1.715	2.946

Table 2. Values of the additive constants that minimize the statistic  $g$ . Values that are one-sixth the minimum observed in the series are in bold.

Survey Name	Constant
<b>Age 0 Indices</b>	
RI Fall 0	<b>0.001667</b>
RI Monthly 0	0.01
CT Fall 0	0.01
MA Seine 0	1
DE 30 0	<b>0.003333</b>
<b>Age 1 Indices</b>	
MA Spring 1	0.01
MA Fall 1	0.01
RI Fall 1	0.01
<b>Age 2 Indices</b>	
MA Fall 2	0.1
<b>Age 3 Indices</b>	
NEC Spring 3	0.01
NEC Fall 3	<b>0.001667</b>
MA Fall 3	0.001
RI Monthly 3	0.01
NJ Trawl 3	2
DE 30 3	100
<b>Age 4 Indices</b>	
NEC Spring 4	0.001
NEC Fall 4	0.1
MA Spring 4	1
MA Fall 4	0.001
RI Fall 4	<b>0.001667</b>
RI Monthly 4	0.1
<b>Age 5-7+ Indices</b>	
NEFSC Spring 5-7+	100
NEFSC Winter 5-7+	<b>0.001667</b>
NJ Trawl 4-7+	0.1

Table 3. Correlation analysis (value of  $r$ ) of various statistical properties of the 24 summer flounder index series with “zero” observations. For  $n = 24$ , the critical value of  $r$  at the 0.05 significance level is about 0.4.

	N	Nzero	Mean	Max	Min	CV	Skew	Kurt	$g$
N	1.00								
Nzero	0.32	1.00							
Mean	0.01	-0.12	1.00						
Max	0.02	-0.08	1.00	1.00					
Min	0.18	-0.28	-0.01	-0.05	1.00				
CV	0.20	0.57	0.31	0.35	-0.19	1.00			
Skew	0.21	0.26	0.50	0.53	0.08	0.88	1.00		
Kurt	0.20	0.26	0.57	0.60	0.05	0.86	0.99	1.00	
$g$	-0.02	0.25	-0.08	-0.07	-0.12	-0.13	-0.24	-0.22	1.00

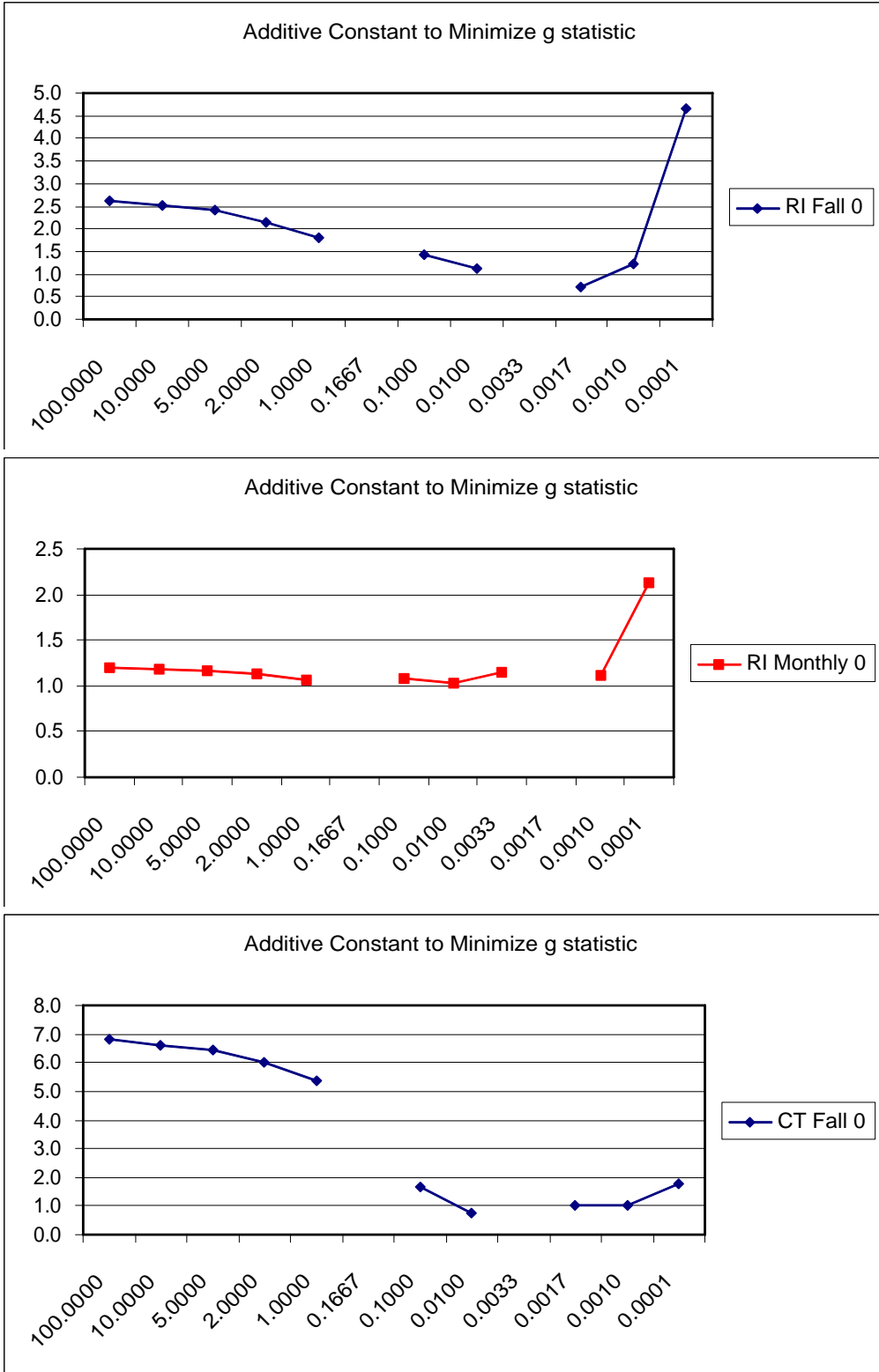


Figure 1.



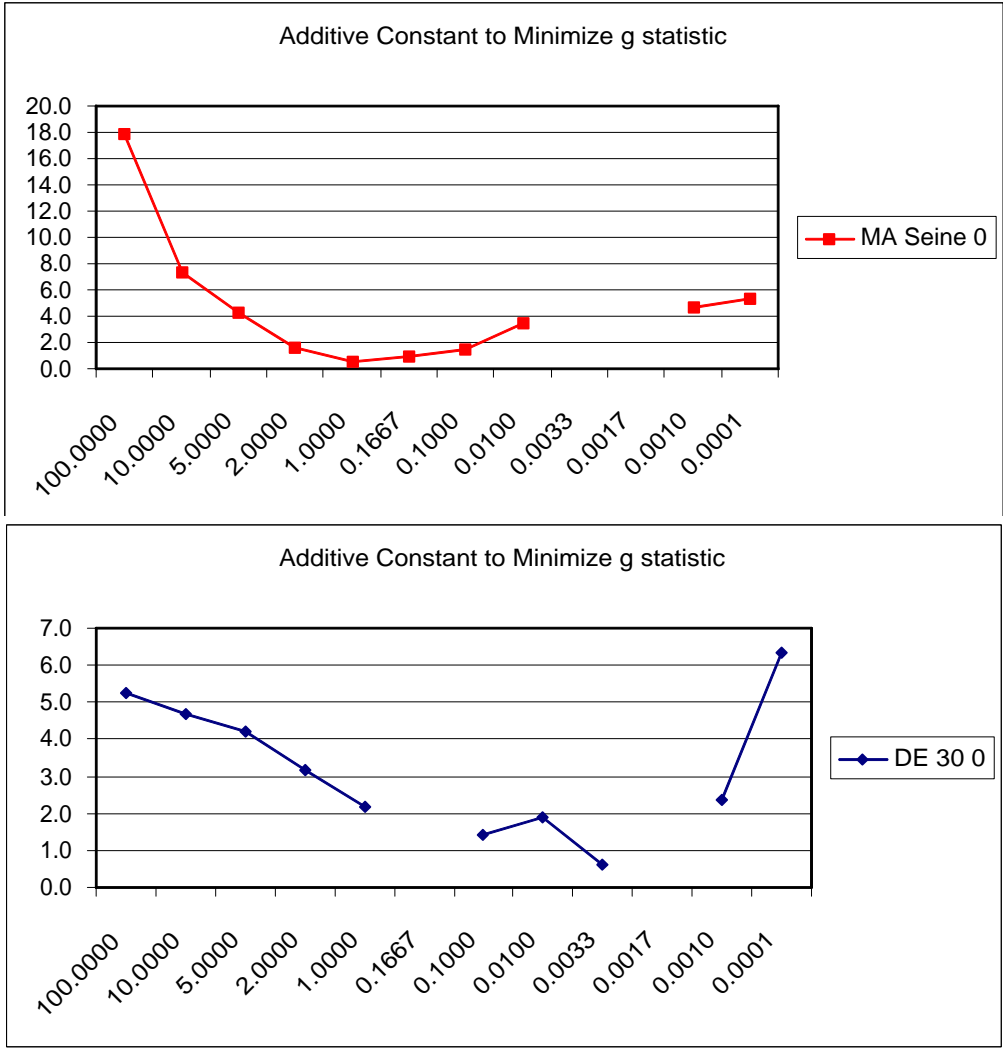


Figure 1 continued.

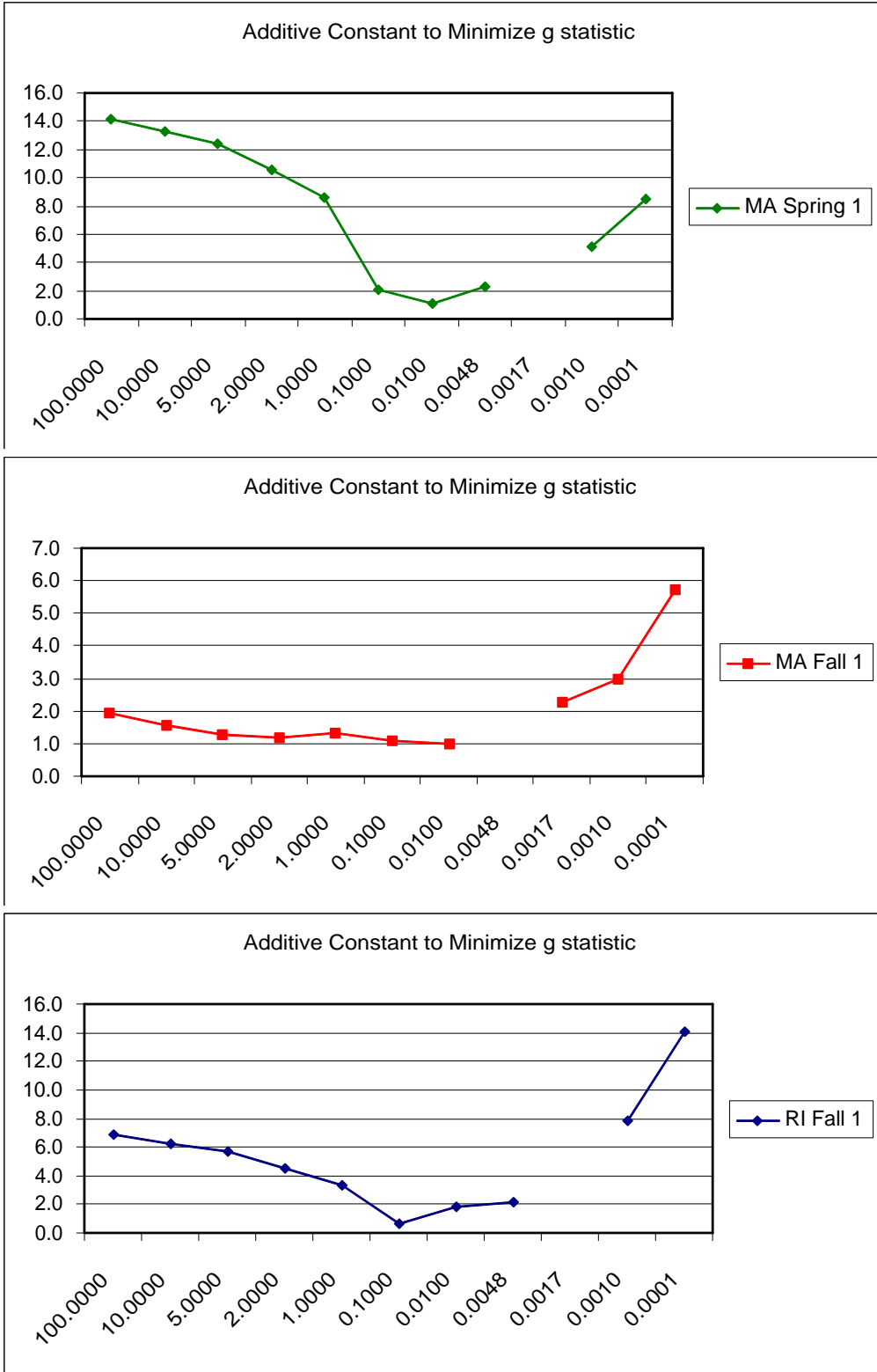


Figure 2.

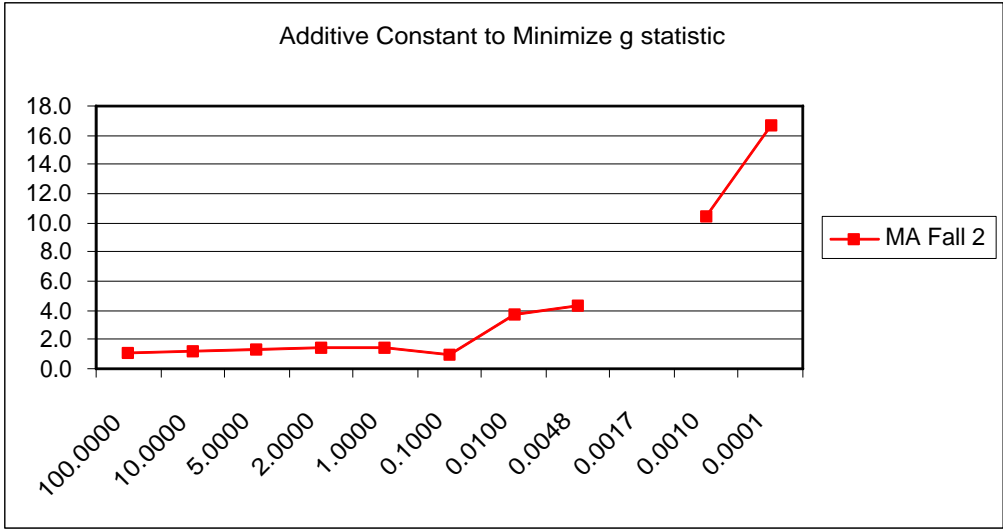


Figure 3.

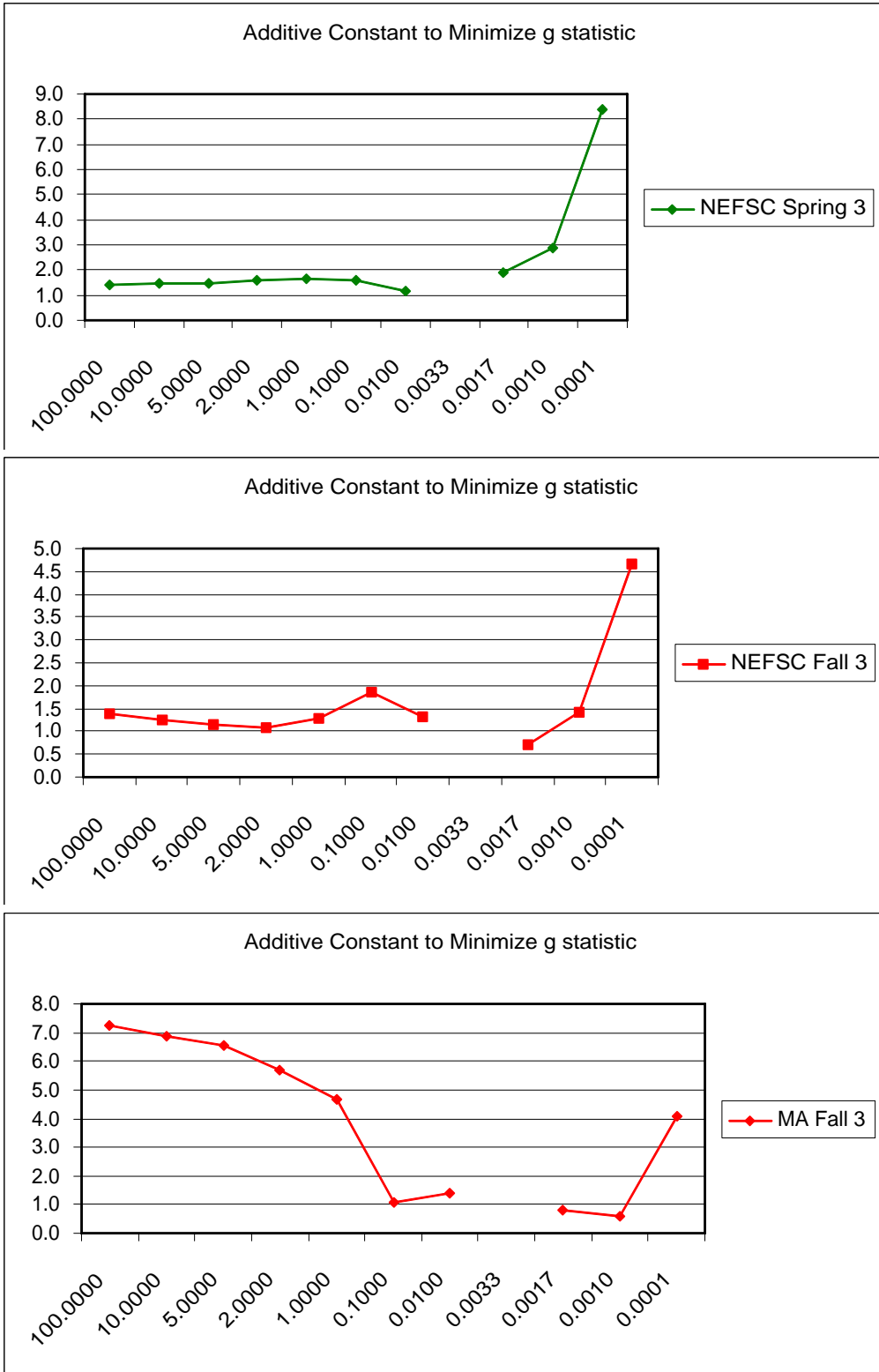


Figure 4.

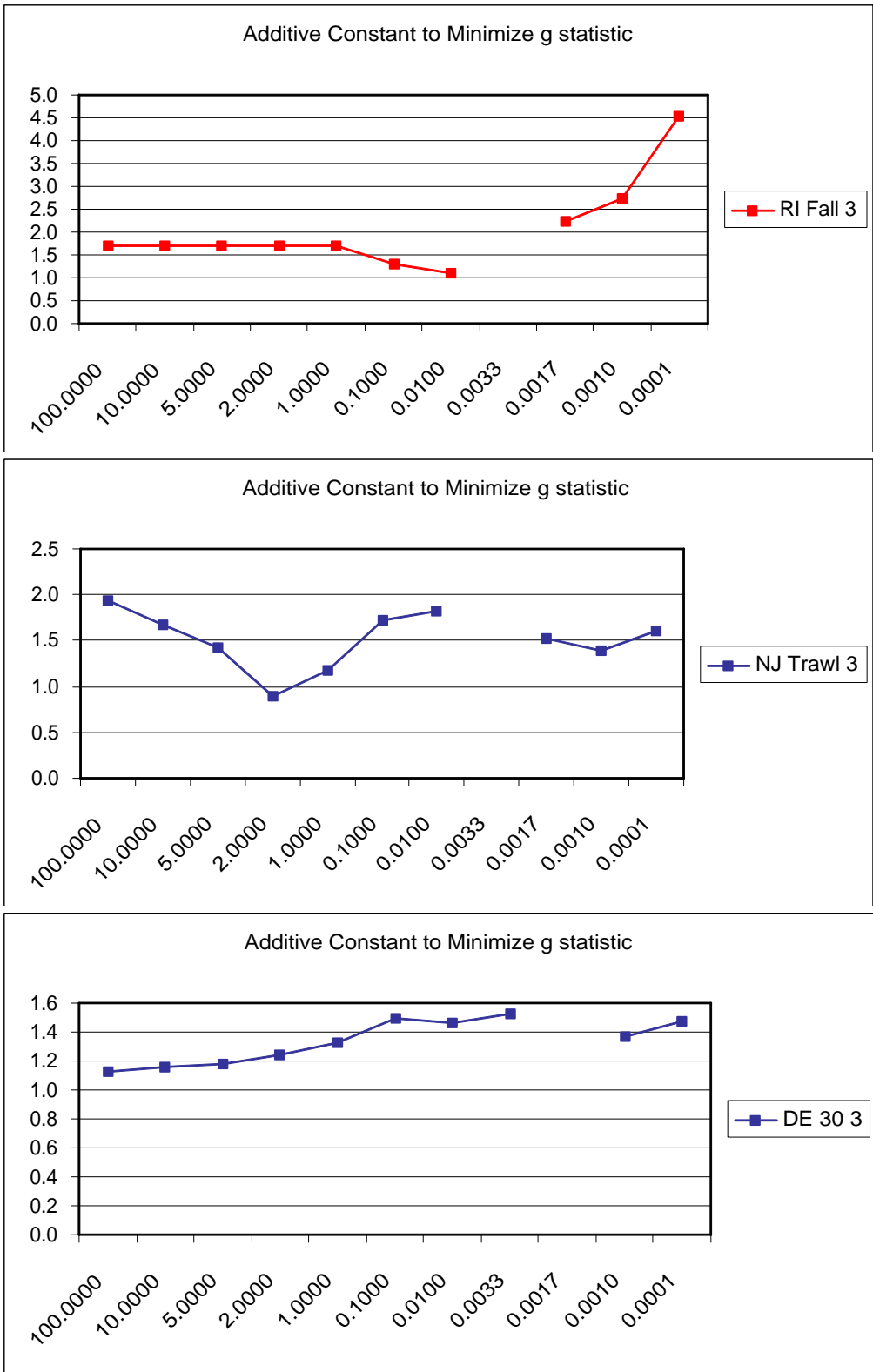


Figure 4 continued.

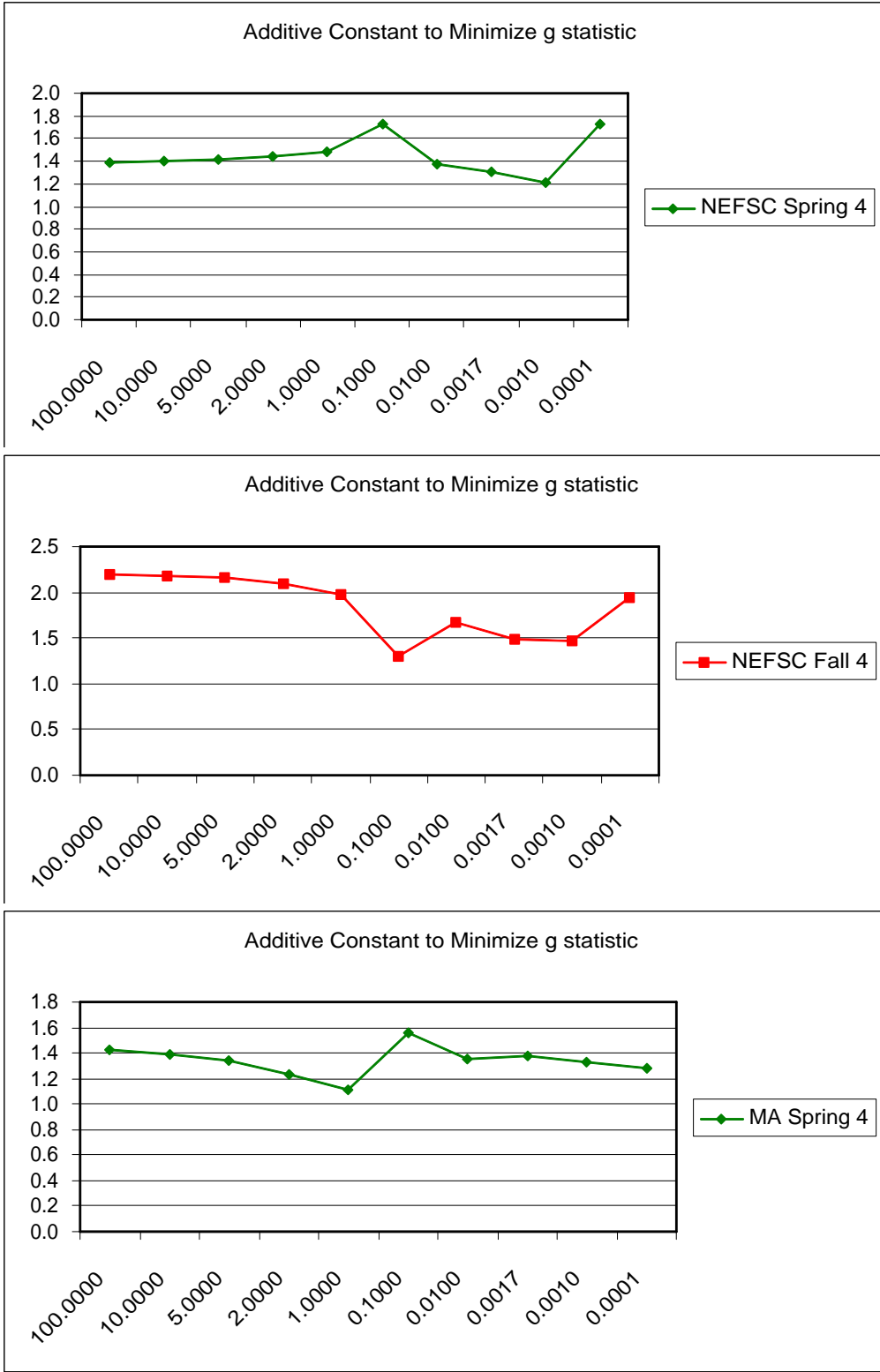


Figure 5.

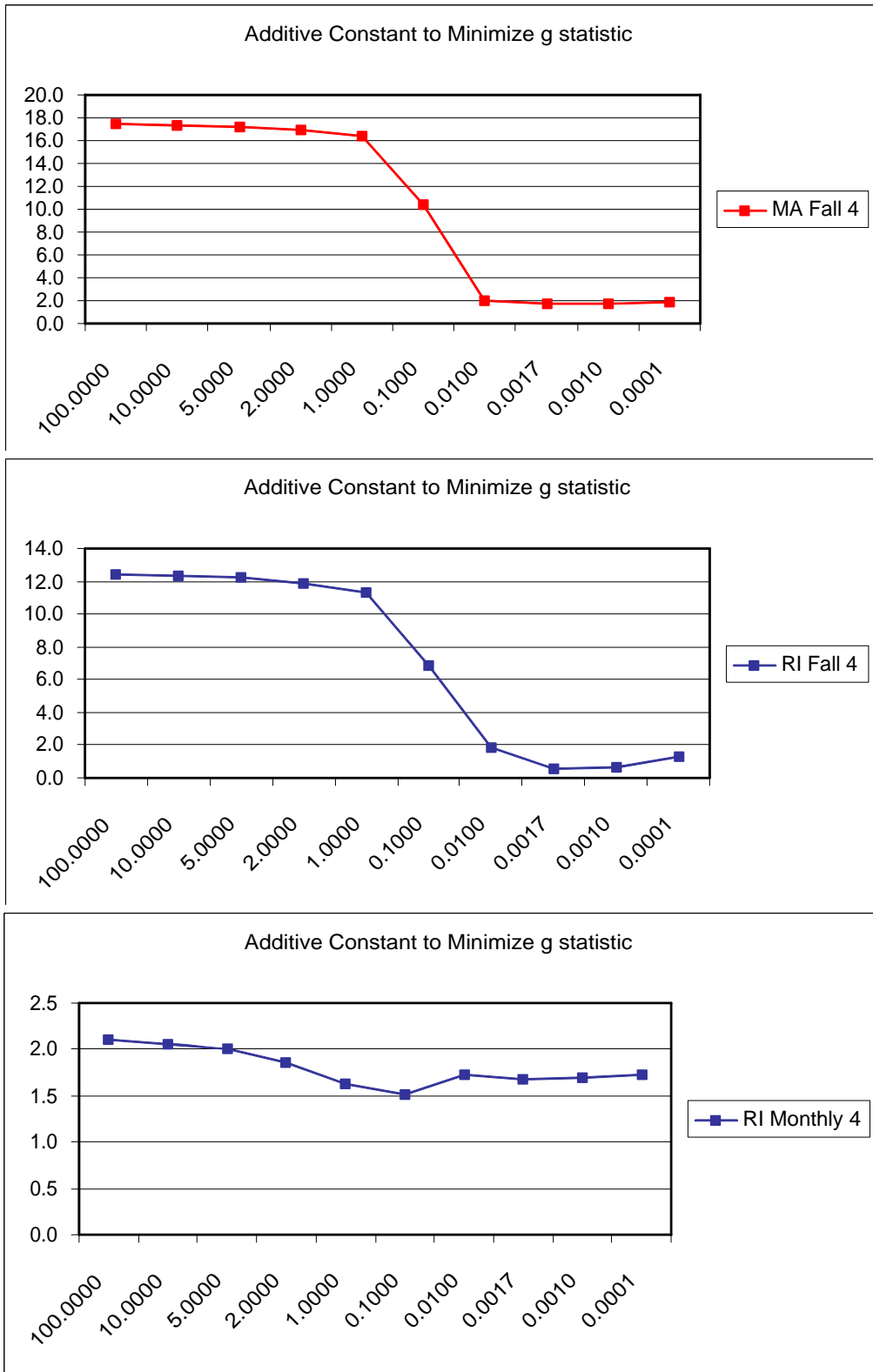


Figure 5 continued.

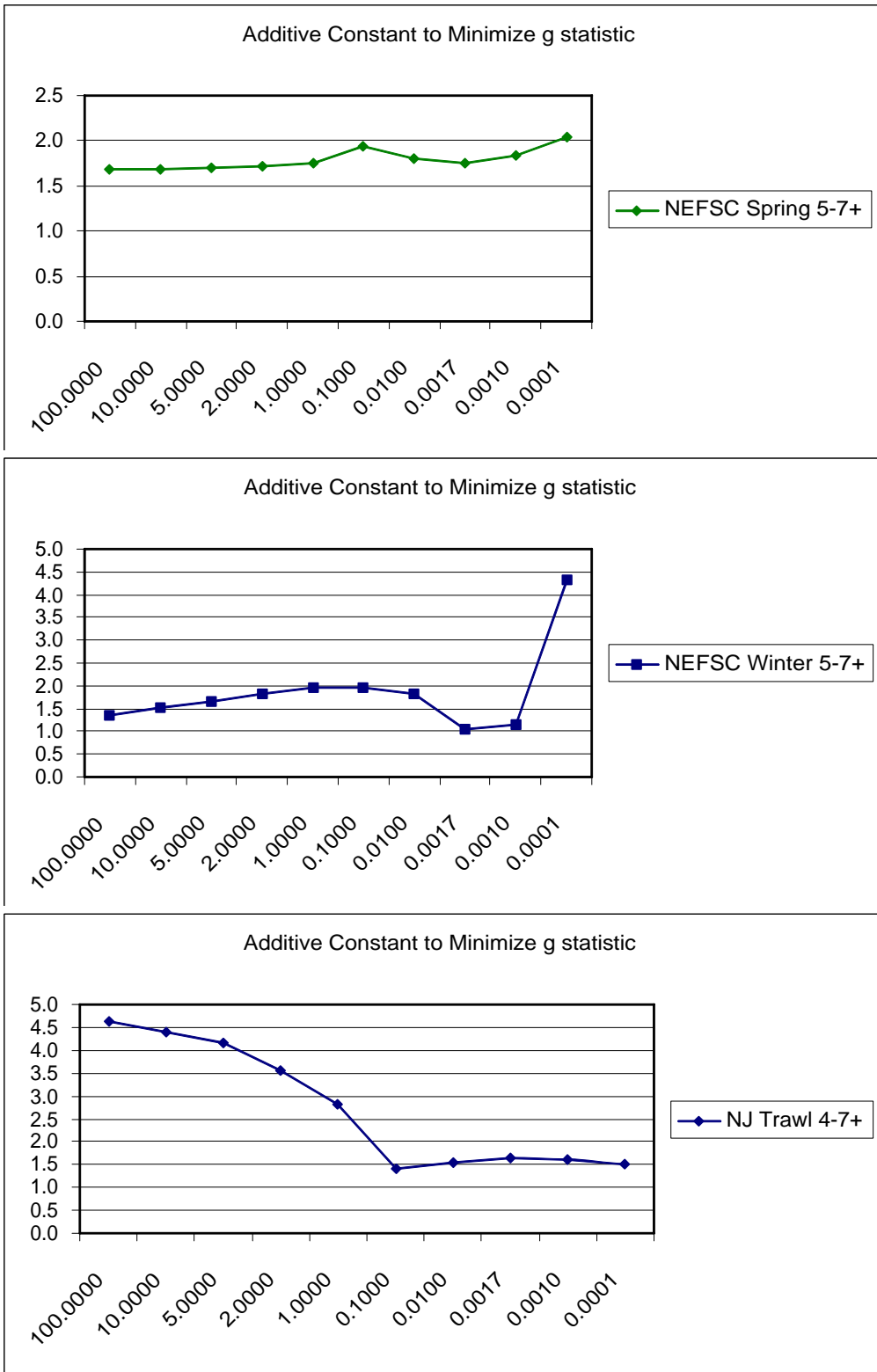


Figure 6.



**APPENDIX 3**

**SAW 47 Working Paper 7 (TOR 3) – Life History Parameters**

**Evaluation of summer flounder life history parameters  
from NEFSC trawl survey data, 1992 – 2006.**



**Jeffrey C. Brust  
New Jersey Division of Fish and Wildlife**

**April 2008**

## Background

In 2000, summer flounder stocks were determined to be overfished. Management of the species entered a ten year rebuilding period in order to increase abundance to sufficient levels. Recent stock assessments indicate that, although fishing mortality has decreased substantially and biomass is at the highest level ever recorded, the stock is still only about 50% of the target biomass. As the end of the rebuilding period nears and quotas continue to drop despite the high biomass, there has been growing concern that the stock assessment and/or biological reference points for the species are flawed.

During the 2007 stock assessment update, it was noted that there have been changes in certain biological parameters of the stock over the last few years. Among these are size at age and sex ratio. Changes in these and other parameters could affect population dynamics and rebuilding rates. The purpose of this paper is to review data collected during National Marine Fisheries Service, Northeast Fishery Science Center seasonal trawl surveys in order to investigate key biological parameters and evaluate potential implications on stock rebuilding and management of the species.

## Methods

Data were obtained from the NEFSC trawl survey database. Since 1992, NEFSC finfish trawl surveys have occurred three to four times per year, and have recorded lengths, weights, ages, and sex from at least a subsample of summer flounder captured in the survey.

### *Length and weight at age*

Evaluation of sample size at age revealed that sample size at older ages was very low, particularly during early years of the analysis. Data were therefore subset to years and ages that had a sufficient sample size.

Trends of size at age over time were evaluated in two ways. First, sex specific mean size at age was calculated for each year with sufficient sample size. SAS Proc REG (SAS 1990) was used to conduct regressions of size at age over time.

Second, observed data were fit to a von Bertalanffy growth function

$$L_t = L_\infty * (1 - e^{-(k*(t-t_0))})$$

to develop annual sex specific predicted length at age estimates using SAS Proc NLIN (SAS 1989a). For each year, residuals were resampled with replacement to develop 500 bootstrap datasets (Barker 2005), each of which was also fit using the von Bertalanffy growth function. Summary statistics were calculated for the parameter estimates, as well as predicted size at age. SAS Proc REG was used to perform regression analysis of mean predicted length at age over time.

For both methods, slope parameters of length at age over time were evaluated at the  $\alpha = 0.10$  level.

Length-weight analysis was also conducted with SAS Proc NLIN using an allometric growth function.

$$W = \alpha L^\beta$$

For each year, residuals between observed and predicted weight at length were calculated and resampled to develop 500 bootstrap datasets which were also fit to the growth function. Summary statistics were calculated for the parameter estimates, as well as predicted weight at length. SAS Proc REG was used to evaluate trends in mean weight at length over time.

#### *Maximum age, sex ratio, and natural mortality*

Maximum age by sex was found by analytical review of the raw data, as were overall sex ratios and sex ratios by age. Sex ratio (*i.e.* percent female) at size was analyzed using SAS Proc GENMOD (SAS 1989b) with a normal distribution and a logit link function (*i.e.* a logistic regression).

Natural mortality for each sex was estimated using the approximation of  $3 / T_{MAX}$  (Hoenig 1983). Annual estimates of natural mortality for the stock were determined using a weighted average of sex-specific natural mortality and annual sex ratio.

#### *Fecundity*

Individual fecundity was estimated by applying the fecundity:length relationship of Morse (1981) to the mid-year length at age for females.

$$F = 0.0007975 * L^{3.402}$$

Number of mature females by age and year were determined by multiplying the VPA estimated abundance at age by sex ratios at age and the VPA input maturity schedule. These were multiplied by fecundity at age and summed across ages to estimate total theoretical fecundity of the stock.

## **Results**

#### *Length and weight at age*

The number of fish observed on trawl surveys was low for some ages and years, particularly during early years of the analysis. Data were therefore subset to years and ages where sample size was generally greater than 50 fish per year (all surveys combined). Prorating ages to the season fish were captured (assuming a January 1 birthdate) as done in earlier drafts resulted in low sample size for some seasons, but fitting equations using ages pooled across surveys in a year resulted in poor or unconverged fits for some years. As a result, length at age calculations (mean and von Bertalanffy) were conducted using samples from the winter survey only. The subset data include years from 1999 to 2006 and ages 0 through 4 for males and 0 through 5 for females. Sample size for these years and ages are generally greater than 40 fish (Table 1).

Mean lengths for males age 1 to 4 show no long term trends between 1999 and 2006 (Table 2, Figure 1), and regression results indicate no significant changes over time (Table 3). Trends in mean length at age for females were similar to males for ages 0 to 4; however, female mean length at age 5 decreased significantly between 1999 and 2006.

Fitting bootstrap data to the von Bertalanffy growth function resulted in unrealistic parameter estimates for males in 2000 and 2006 (Table 4). Bootstrap average maximum length for these years was approximately 100,000 cm. Although the mean estimated parameter values produce unrealistic estimates of length at age, specific bootstrap replicates with large maximum size estimates had correspondingly lower estimates of the growth parameter  $k$ , such that mean predicted length at age was not erratic for fish less than 8 years old. Regression results for length

at ages 0 to 10 (the approximate age range observed in survey data) showed no significant trends (Table 5, Figure 2).

Estimated von Bertalanffy parameters for females were also unrealistic in 2000, though much less so than for males (Table 6). Regression results indicate no significant trend in predicted length at age for ages 0 to 4; however, predicted length at ages five and older decreased significantly between 1999 and 2006 (Table 7, Figure 3). For both males and females, regression results using von Bertalanffy predicted length at age were consistent with results of mean length at age.

Length:weight analysis was conducted on the same subset of years and ages as age:length analysis. As before, sample size was generally above 40 fish (Table 8). No significant trends were observed for weight at length for males (Tables 9 and 10, Figure 4) or females (Tables 11 and 12, Figure 5).

#### *Maximum age, sex ratio, and natural mortality*

Between 1985 and 1995, maximum age for males generally varied between age 4 and 5, while female maximum age ranged from age 6 to 8 (Figure 6). By 2000, maximum age of males had increased to between 8 and 9, where it remained stable until 2007 when one 12 year old male was captured. Female maximum age has increased steadily since 1995, with a peak of 14 years in 2005.

From 1992 to 1997 overall sex ratio averaged approximately 54% female (Figure 7). From 1997 to 2000, females increased from 53 to 58% of the stock, where it remained stable for 3 years. In 2003, the ratio dropped to 51% female and has varied widely from 47 to 57% since then.

Natural mortality was estimated as a weighted average of sex ratio and sex-specific natural mortality. Using maximum ages of 12 and 15 for males and females, respectively, sex-specific natural mortality is estimated at 0.25 for males and 0.20 for females. Applying these to overall sex ratios,  $M$  has remained relatively stable around 0.223, with a range of 0.221 in 2000 to 0.226 in 2005 (Figure 7).

Sex ratios by age (Figure 8) show a general decrease in percent female at age since the mid 1990s for all ages, although the declines are more evident for ages 2 and above. For example, 3 year old fish have dropped from an average of 75% female during 1992 to 1994 to 56% female in 2004 to 2006. Four year old fish have dropped from 85% female to 62% female over the same time period.

Sex ratio at size data (discussed below) indicate that greater than 90% of fluke can be sexed by 25 cm. Von Bertalanffy estimates indicate that both males and females attain this size by age 1. By age 2 both males and females have recruited to the commercial fishery (36 cm, 14"), so age 1 is the only age where they are large enough to be sexed and experience no harvest pressure. Natural mortality for age 1 fish is generally stable between 0.225 and 0.23 from 1992 to 2002, but has increased to approximately 0.235 in recent years (Figure 9). Even though age 2 fish are exploited, the sex ratio averages approximately 50:50 up to 43 cm (17", age 3), and both sexes are likely harvested in equal proportions. Natural mortality of age 2 fish shows a gradual increase from 0.216 to 0.23 from 1992 to 2005, before dropping sharply back to 0.224 in 2006. Average  $M$  for age 1 and 2 also shows a gradual increase over all years from 0.222 to approximately 0.23.

When data are combined across years, logistic regression of percent female at size shows a 50:50 sex ratio at around 38 cm (15"). Fish smaller than this size are predominantly male,

while larger fish are predominantly female (Figure 10). Using annual data, the 50% inflection ranges from 33 cm in 1992 and 1995 to 43 cm in 2003 and 2005 (Figure 11).

Combined data show that greater than 90% of all animals 25 cm and larger can be sexed. Sex ratio for fish 25-35 cm (*i.e.* able to be sexed but less than minimum size) has decreased from an average of 34.5% females for 1992-94 to 29.4% for 2004-06 (Figure 12). Natural mortality for fish in this size range has increased from an average of 0.233 for 1992-94 to 0.235 for 2004-06 (Figure 13). From 35 cm to 43 cm, the sex ratio is approximately 50:50, and fish in this size range are likely exploited in similar proportions. The sex ratio for fish 25 to 43 cm shows a decline from 48.4% female in 1992-1994 to 37.2% in 2004-2006. *M* for this size range has increased from 0.226 to 0.231 over the same time period.

### *Fecundity*

Because of the concerns with sample size for age:length data, fecundity could only be evaluated for the years 1999 to 2006. Theoretical fecundity of the stock increased steadily from approximately  $22.3 \times 10^{12}$  eggs in 1999 to a maximum of over  $36.5 \times 10^{12}$  eggs in 2004 (Figure 14). Fecundity has decreased in each of the last two years, to approximately  $31.0 \times 10^{12}$  eggs in 2006. During this time period, recruitment (VPA output) has remained relatively stable between 28 million and 38 million individuals, except for 2004 where recruitment was estimated at only 17 million. The relationship between fecundity and recruitment is slightly negative, although this appears to be driven primarily by the 2004 data point (highest fecundity and lowest recruitment).

## **Discussion**

Summer flounder biomass has increased substantially during the rebuilding period, yet managers continue to cut annual quotas in an attempt to reach established biomass reference points. This has led many managers and industry stakeholders to question the accuracy of the reference point targets. In recent months, evidence has been presented that summer flounder stocks may be experiencing changes in life history parameters, such as size at age and sex ratios. In addition, there have been implications that management measures themselves are impeding stock rebuilding by selectively harvesting larger individuals which are primarily female. This paper was undertaken to evaluate certain life history parameters and the implications they have on stock rebuilding.

Dery 1988 found males reached a maximum age of 7 years and females 12 years. This is generally consistent with maximum ages observed in NEFSC trawl surveys from 1992 to 2000. Since then, maximum ages of both males and females captured in the NEFSC trawl surveys have approximately doubled, likely as a result of reduced fishing mortality allowing fish to survive to older ages. Trawl data indicate that maximum ages of 12 for males and 15 for females may be more appropriate. As maximum ages for both sexes were observed in recent years, additional years of reduced fishing pressure may result in even older maximum ages. In addition, maximum ages may be confounded with survey catchability at size.

As identified by Terceiro (pers. comm.) length and weight at age do appear to have decreased in recent years. For males, decreases in length at age are not yet statistically significant, but may become so if the trend continues. For females, significant decreases in length at age have been observed for ages 5 and older. Although length:weight relationships

have not changed, decreased length at age results in lower weight at age, which may result in slower than anticipated rebuilding rates.

In recent months, many fishermen have expressed concern regarding the finding of the NEAMAP trawl survey that most fluke greater than 41 cm (16") are female. These findings are not new (*e.g.* Murawski and Figley 1977, Morse 1981), but this sexual dimorphism has greater implications for management and stock rebuilding as minimum size limits increase in an effort to reduce harvest. There does appear to be a general decline in the ratio of females to males observed in the trawl survey. However, for many ages this decline has been observed over 15 years, much longer than states have required large minimum sizes.

Natural mortality for summer flounder is generally approximated as  $M = 0.2$  based on longevity information. Because summer flounder males and females appear to have different maximum ages, the sex ratio of the population could affect the overall stock natural mortality rate. The shift in sex ratio towards more males in recent years has led to a slight increase in natural mortality for the stock, but the increase does not appear substantial enough to affect rebuilding. However, estimates based on current data indicate that  $M = 0.22$  might be a more appropriate estimate of overall natural mortality. A higher natural mortality rate would result in a higher  $F_{\text{Target}}$  and lower  $\text{SSB}_{\text{Target}}$  than currently estimated. Although this analysis provides evidence for a higher  $M$ , additional analyses should be conducted. The Hoenig (1983) approximation used in this paper is often criticized as being inadequate (*e.g.* Pascual and Iribarne 1993, Hewitt and Hoenig 2005). In addition, maximum ages captured by trawl in a stock that is undergoing rebuilding may be underestimated.

Morse (1981) found that length was the best indicator of fecundity in fluke. Changes in female length at age and management strategies directing effort to large females could affect fecundity of the stock. In general, however, increases in total abundance have outpaced any decreases in fecundity, resulting in theoretical stock fecundity increasing more than 50% from 1999 to 2004. Fecundity declined in 2005 and 2006, coincident with slower stock growth. However, additional years of data are necessary to determine if there is a causal relationship.

## Conclusions

Review of NEFSC trawl survey data do indicate that certain life history parameters have changed since 1992. Length at age has decreased significantly for older females. Maximum ages have approximately doubled since 2000. Sex ratios have shifted towards higher proportions of males. Natural mortality based on longevity and sex ratio has increased slightly. Despite decreases in fecundity at age, overall theoretical stock fecundity was higher in 2006 than in 1999. The implications of these patterns in biological parameters should be reviewed and considered when evaluating potential management strategies for stock rebuilding.

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**Table 1. Sample size by age and year from the winter survey. Cells in bold italics indicate the years and ages used in the age:length analysis. A) Males, B) Females**

<b>A)</b>								
<b>Year</b>	<b>Age</b>							
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8+</b>
1992	150	75	14	1				
1993	113	144	5		1			
1994	102	185	19	6				
1995	92	155	3	1				
1996	229	145	18	2				
1997	106	152	27	22	4			
1998	67	92	71	7	2			1
1999	<b>46</b>	<b>161</b>	<b>101</b>	<b>15</b>	6			
2000	<b>18</b>	<b>164</b>	<b>122</b>	<b>72</b>	13	5	1	2
2001	<b>70</b>	<b>186</b>	<b>160</b>	<b>81</b>	23	10		2
2002	<b>75</b>	<b>239</b>	<b>172</b>	<b>75</b>	17	6	1	1
2003	<b>127</b>	<b>161</b>	<b>117</b>	<b>45</b>	12	3	1	1
2004	<b>51</b>	<b>221</b>	<b>112</b>	<b>46</b>	17	7	3	3
2005	<b>76</b>	<b>127</b>	<b>77</b>	<b>38</b>	19	8	2	2
2006	<b>72</b>	<b>148</b>	<b>78</b>	<b>50</b>	22	9	5	5
<b>B)</b>								
<b>Year</b>	<b>Age</b>							
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8+</b>
1992	138	175	17	3	1	3		
1993	88	242	30	5	1	2		
1994	67	285	63	22			1	
1995	145	195	28	3				
1996	221	263	51	10	2			
1997	140	247	69	23	12	4		
1998	46	133	140	62	16	2		
1999	<b>48</b>	<b>135</b>	<b>151</b>	<b>92</b>	<b>35</b>	9	5	3
2000	<b>24</b>	<b>155</b>	<b>176</b>	<b>169</b>	<b>86</b>	18	10	3
2001	<b>113</b>	<b>149</b>	<b>279</b>	<b>146</b>	<b>74</b>	43	12	10
2002	<b>101</b>	<b>273</b>	<b>201</b>	<b>148</b>	<b>94</b>	43	14	4
2003	<b>83</b>	<b>145</b>	<b>134</b>	<b>99</b>	<b>59</b>	28	24	15
2004	<b>55</b>	<b>201</b>	<b>166</b>	<b>110</b>	<b>51</b>	45	24	31
2005	<b>45</b>	<b>89</b>	<b>103</b>	<b>54</b>	<b>37</b>	21	13	25
2006	<b>46</b>	<b>179</b>	<b>102</b>	<b>89</b>	<b>72</b>	36	18	43



Table 2. Results of mean length (cm) at age.

Sex	Age		Year							
			1999	2000	2001	2002	2003	2004	2005	2006
Males	1	<b>Mean</b>	27.15	27.67	28.20	28.91	29.83	28.53	27.66	29.75
Males	1	<b>Std Dev</b>	3.47	2.22	2.39	2.96	3.39	2.79	2.91	3.54
Males	2	<b>Mean</b>	36.36	34.37	36.18	36.85	37.64	36.62	36.42	34.99
Males	2	<b>Std Dev</b>	3.30	2.56	2.91	2.79	3.05	3.09	3.16	2.91
Males	3	<b>Mean</b>	42.27	39.98	41.11	42.94	44.01	42.59	42.14	39.86
Males	3	<b>Std Dev</b>	2.98	2.95	3.00	2.93	3.39	2.90	2.90	3.52
Males	4	<b>Mean</b>	47.47	45.74	46.99	48.19	48.51	47.72	45.82	44.36
Males	4	<b>Std Dev</b>	3.64	3.18	3.21	3.36	3.45	2.79	3.14	3.08
Females	1	<b>Mean</b>	28.98	28.29	28.27	30.00	31.27	28.84	28.09	29.83
Females	1	<b>Std Dev</b>	3.18	2.93	2.83	3.33	3.16	3.30	2.98	3.97
Females	2	<b>Mean</b>	38.78	37.51	38.79	40.24	41.12	40.32	39.02	38.94
Females	2	<b>Std Dev</b>	3.58	4.18	3.76	3.35	3.48	3.52	3.50	3.40
Females	3	<b>Mean</b>	46.97	44.23	46.19	48.10	48.94	47.49	46.27	43.34
Females	3	<b>Std Dev</b>	2.87	4.11	3.79	3.94	3.66	3.08	3.28	4.13
Females	4	<b>Mean</b>	53.10	52.41	54.47	54.61	55.58	53.75	52.09	49.52
Females	4	<b>Std Dev</b>	3.03	3.70	4.29	3.65	3.63	3.38	3.12	3.76
Females	5	<b>Mean</b>	60.49	57.98	59.49	60.30	58.59	57.65	56.95	53.32
Females	5	<b>Std Dev</b>	3.74	3.25	4.16	3.57	4.60	3.51	3.12	3.01

Table 3. Regression results for the slope of mean length at age over time. Rows in bold italics are significant at 0.05 level.

Sex	Age	RMSE	Estimate	Std Err	T value	P Value	Lo 95 CI	Up 95 CI
Male	1	0.8577	0.2388	0.1324	1.8041	0.1213	-0.0851	0.5626
Male	2	1.1190	0.0334	0.1727	0.1936	0.8529	-0.3891	0.4559
Male	3	1.5629	-0.0065	0.2412	-0.0270	0.9794	-0.5966	0.5836
Male	4	1.4199	-0.2242	0.2191	-1.0234	0.3456	-0.7603	0.3119
Female	1	1.1565	0.0936	0.1785	0.5247	0.6186	-0.3430	0.5303
Female	2	1.1513	0.1691	0.1776	0.9521	0.3778	-0.2656	0.6038
Female	3	2.0131	-0.1241	0.3106	-0.3995	0.7034	-0.8842	0.6360
Female	4	1.8421	-0.3315	0.2842	-1.1663	0.2878	-1.0270	0.3640
<b>Female</b>	<b>5</b>	<b>1.5172</b>	<b>-0.7445</b>	<b>0.2341</b>	<b>-3.1803</b>	<b>0.0191</b>	<b>-1.3174</b>	<b>-0.1717</b>

**Table 4. Results of von Bertalanffy growth analysis using bootstrap data for males.**  
**A) Parameter estimates, B) Predicted length at age. Lengths are in cm.**

A)

Param		Year							
		1999	2000	2001	2002	2003	2004	2005	2006
L_inf	Mean	57.69	105879.36	73.02	69.65	66.93	66.29	52.88	99089.26
L_inf	Std Err	0.24	15286.72	0.79	0.31	0.33	0.32	0.10	13789.90
k	Mean	0.37	0.07	0.19	0.22	0.25	0.25	0.43	0.08
k	Std Err	3.69E-03	2.59E-03	2.42E-03	2.02E-03	2.44E-03	2.51E-03	2.71E-03	2.87E-03
t0	Mean	-0.82	-2.87	-1.77	-1.51	-1.45	-1.40	-0.73	-3.67
t0	Std Err	1.15E-02	3.30E-02	1.67E-02	1.14E-02	1.22E-02	1.34E-02	7.46E-03	4.30E-02

B)

Age		Year							
		1999	2000	2001	2002	2003	2004	2005	2006
0	Mean	14.17	21.13	19.74	19.15	19.62	18.49	14.06	23.98
0	Std Err	0.10	0.06	0.05	0.05	0.05	0.06	0.07	0.04
1	Mean	27.26	27.95	28.53	28.95	29.80	28.66	27.67	29.75
1	Std Err	0.02	0.02	0.02	0.01	0.01	0.02	0.02	0.02
2	Mean	36.26	34.27	35.74	36.79	37.70	36.56	36.45	35.03
2	Std Err	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
3	Mean	42.49	40.14	41.67	43.06	43.84	42.73	42.13	39.88
3	Std Err	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
4	Mean	46.83	45.61	46.56	48.09	48.64	47.56	45.82	44.35
4	Std Err	0.03	0.01	0.01	0.01	0.02	0.02	0.02	0.02
5	Mean	49.88	50.73	50.61	52.13	52.39	51.35	48.23	48.50
5	Std Err	0.06	0.04	0.03	0.03	0.04	0.04	0.03	0.04
6	Mean	52.04	55.53	53.97	55.39	55.34	54.34	49.80	52.35
6	Std Err	0.08	0.07	0.06	0.05	0.06	0.06	0.05	0.07
7	Mean	53.57	60.05	56.77	58.01	57.66	56.70	50.84	55.95
7	Std Err	0.11	0.11	0.09	0.07	0.09	0.08	0.06	0.11
8	Mean	54.66	64.31	59.10	60.14	59.49	58.57	51.52	59.32
8	Std Err	0.13	0.16	0.11	0.09	0.11	0.11	0.07	0.16
9	Mean	55.45	68.35	61.06	61.86	60.94	60.06	51.97	62.49
9	Std Err	0.15	0.21	0.14	0.12	0.13	0.13	0.08	0.21
10	Mean	56.03	72.18	62.70	63.26	62.09	61.24	52.27	65.48
10	Std Err	0.16	0.27	0.17	0.14	0.15	0.15	0.08	0.27

**Table 5. Regression results for the slope of male predicted length at age over time.**

Age	RMSE	Estimate	Std Err	T value	P Value	Lo 95 CI	Up 95 CI
0	3.4782	0.3580	0.5367	0.6671	0.5295	-0.9552	1.6713
1	0.8369	0.2059	0.1291	1.5940	0.1620	-0.1101	0.5219
2	1.1417	0.0678	0.1762	0.3851	0.7135	-0.3632	0.4989
3	1.4866	-0.0515	0.2294	-0.2243	0.8300	-0.6128	0.5099
4	1.4686	-0.1516	0.2266	-0.6691	0.5283	-0.7061	0.4029
5	1.5410	-0.2343	0.2378	-0.9851	0.3626	-0.8161	0.3476
6	2.0495	-0.3016	0.3162	-0.9538	0.3770	-1.0754	0.4722
7	2.9216	-0.3561	0.4508	-0.7900	0.4596	-1.4592	0.7469
8	3.9818	-0.4000	0.6144	-0.6511	0.5391	-1.9034	1.1033
9	5.1309	-0.4353	0.7917	-0.5498	0.6023	-2.3725	1.5020
10	6.3189	-0.4635	0.9750	-0.4753	0.6514	-2.8493	1.9223

Table 6. Results of von Bertalanffy growth analysis using bootstrap data for females.  
A) Parameter estimates, B) Predicted length at age. Lengths are in cm.

A)

Param		Year							
		1999	2000	2001	2002	2003	2004	2005	2006
L <sub>inf</sub>	Mean	98.94	175.38	95.32	83.70	72.92	68.16	70.01	68.25
L <sub>inf</sub>	Std Err	0.55	21.38	0.35	0.19	0.13	0.09	0.15	0.22
k	Mean	0.15	0.09	0.16	0.21	0.28	0.33	0.29	0.24
k	Std Err	1.39E-03	1.60E-03	1.07E-03	9.93E-04	1.31E-03	1.36E-03	1.58E-03	1.90E-03
t0	Mean	-1.40	-1.87	-1.22	-1.17	-0.98	-0.70	-0.82	-1.58
t0	Std Err	9.69E-03	1.71E-02	6.70E-03	5.92E-03	5.94E-03	5.43E-03	6.54E-03	1.37E-02

B)

Age		Year							
		1999	2000	2001	2002	2003	2004	2005	2006
0	Mean	18.21	19.38	16.81	17.86	17.46	13.87	14.44	20.67
0	Std Err	0.05	0.07	0.04	0.04	0.05	0.06	0.06	0.07
1	Mean	29.22	28.68	28.42	30.13	31.08	29.11	28.31	30.55
1	Std Err	0.02	0.03	0.02	0.01	0.02	0.02	0.02	0.02
2	Mean	38.67	37.15	38.28	40.10	41.33	40.05	38.68	38.32
2	Std Err	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
3	Mean	46.79	44.85	46.66	48.19	49.05	47.90	46.44	44.44
3	Std Err	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
4	Mean	53.77	51.88	53.79	54.76	54.86	53.55	52.25	49.28
4	Std Err	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
5	Mean	59.78	58.29	59.85	60.11	59.25	57.61	56.62	53.10
5	Std Err	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.02
6	Mean	64.96	64.15	65.01	64.46	62.56	60.54	59.90	56.13
6	Std Err	0.04	0.04	0.03	0.02	0.03	0.03	0.04	0.03
7	Mean	69.42	69.52	69.40	68.00	65.07	62.64	62.36	58.54
7	Std Err	0.06	0.07	0.05	0.04	0.04	0.04	0.05	0.05
8	Mean	73.27	74.43	73.15	70.88	66.96	64.17	64.22	60.45
8	Std Err	0.09	0.10	0.07	0.05	0.05	0.05	0.06	0.06
9	Mean	76.60	78.94	76.34	73.22	68.39	65.26	65.62	61.98
9	Std Err	0.11	0.14	0.09	0.06	0.06	0.06	0.08	0.08
10	Mean	79.48	83.08	79.06	75.14	69.48	66.06	66.68	63.19
10	Std Err	0.14	0.18	0.11	0.08	0.07	0.06	0.09	0.10

Table 7. Regression results for the slope of female predicted length at age over time.  
Rows in bold italics are significant at the 0.05 level.

Age	RMSE	Estimate	Std Err	T value	P Value	Lo 95 CI	Up 95 CI
0	2.4271	-0.1979	0.3745	-0.5284	0.6162	-1.1143	0.7185
1	1.0632	0.1244	0.1641	0.7584	0.4770	-0.2770	0.5258
2	1.3838	0.1393	0.2135	0.6525	0.5383	-0.3832	0.6618
3	1.7126	-0.0470	0.2643	-0.1778	0.8648	-0.6936	0.5997
4	1.7485	-0.3597	0.2698	-1.3330	0.2309	-1.0198	0.3005
5	<b>1.5973</b>	<b>-0.7464</b>	<b>0.2465</b>	<b>-3.0283</b>	<b>0.0232</b>	<b>-1.3494</b>	<b>-0.1433</b>
6	<b>1.4044</b>	<b>-1.1709</b>	<b>0.2167</b>	<b>-5.4032</b>	<b>0.0017</b>	<b>-1.7012</b>	<b>-0.6407</b>
7	<b>1.3408</b>	<b>-1.6087</b>	<b>0.2069</b>	<b>-7.7758</b>	<b>0.0002</b>	<b>-2.1149</b>	<b>-1.1025</b>
8	<b>1.5285</b>	<b>-2.0433</b>	<b>0.2359</b>	<b>-8.6636</b>	<b>0.0001</b>	<b>-2.6204</b>	<b>-1.4662</b>
9	<b>1.9350</b>	<b>-2.4642</b>	<b>0.2986</b>	<b>-8.2531</b>	<b>0.0002</b>	<b>-3.1948</b>	<b>-1.7336</b>
10	<b>2.4627</b>	<b>-2.8649</b>	<b>0.3800</b>	<b>-7.5389</b>	<b>0.0003</b>	<b>-3.7947</b>	<b>-1.9350</b>

Table 8. Sample size of weights by age and year from the winter survey. Cells in bold italics indicate the years and ages used in the age:length analysis. A) Males, B) Females

A)		AGE							
Year	1	2	3	4	5	6	7	8+	
1992									
1993	113	144	5		1			0	
1994	99	184	19	6				0	
1995	92	155	3	1				0	
1996	229	144	18	2				0	
1997	106	151	26	22	4			0	
1998	67	92	71	7	2			1	
1999	<b>46</b>	<b>159</b>	<b>101</b>	<b>15</b>	6			0	
2000	<b>18</b>	<b>164</b>	<b>122</b>	<b>72</b>	13	5	1	2	
2001	<b>70</b>	<b>186</b>	<b>160</b>	<b>81</b>	23	10		2	
2002	<b>75</b>	<b>239</b>	<b>172</b>	<b>75</b>	17	6	1	1	
2003	<b>127</b>	<b>161</b>	<b>117</b>	<b>45</b>	12	3	1	1	
2004	<b>51</b>	<b>221</b>	<b>112</b>	<b>46</b>	17	7	3	3	
2005	<b>76</b>	<b>127</b>	<b>77</b>	<b>38</b>	19	8	2	2	
2006	<b>72</b>	<b>148</b>	<b>78</b>	<b>50</b>	22	9	5	5	
B)		AGE							
Year	1	2	3	4	5	6	7	8+	
1992									
1993	88	242	30	5	1	2		0	
1994	67	285	63	22			1	0	
1995	141	191	28	3				0	
1996	219	263	51	10	2			0	
1997	140	246	69	23	12	4		0	
1998	46	133	139	62	16	2		0	
1999	<b>48</b>	<b>135</b>	<b>151</b>	<b>92</b>	<b>35</b>	9	5	3	
2000	<b>24</b>	<b>155</b>	<b>176</b>	<b>169</b>	<b>86</b>	18	10	3	
2001	<b>113</b>	<b>149</b>	<b>279</b>	<b>146</b>	<b>74</b>	43	12	10	
2002	<b>101</b>	<b>272</b>	<b>201</b>	<b>148</b>	<b>94</b>	43	14	4	
2003	<b>83</b>	<b>145</b>	<b>134</b>	<b>99</b>	<b>59</b>	28	24	15	
2004	<b>55</b>	<b>201</b>	<b>166</b>	<b>110</b>	<b>51</b>	45	24	31	
2005	<b>45</b>	<b>89</b>	<b>103</b>	<b>54</b>	<b>37</b>	21	13	25	
2006	<b>46</b>	<b>179</b>	<b>102</b>	<b>89</b>	<b>72</b>	36	18	43	

**Table 9. Results of length:weight analysis using bootstrap data for males.**  
**A) Parameter estimates, B) Predicted length at age. Weights are in kg.**

A)

Param		Year							
		1999	2000	2001	2002	2003	2004	2005	2006
a	Mean	5.27E-06	6.73E-06	3.61E-06	5.67E-06	4.10E-06	4.61E-06	3.25E-06	9.14E-06
a	Std Err	2.66E-08	2.98E-08	1.87E-08	2.09E-08	1.88E-08	2.46E-08	1.63E-08	4.81E-08
b	Mean	3.18	3.11	3.28	3.15	3.24	3.21	3.31	3.03
b	Std Err	1.35E-03	1.17E-03	1.38E-03	9.75E-04	1.20E-03	1.43E-03	1.35E-03	1.42E-03

B)

Length (cm)		Year							
		1999	2000	2001	2002	2003	2004	2005	2006
10	Mean	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
10	Std Err	1.52E-05	1.49E-05	1.38E-05	1.17E-05	1.29E-05	1.55E-05	1.28E-05	1.93E-05
20	Mean	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.08
20	Std Err	7.17E-05	6.85E-05	7.12E-05	5.61E-05	6.59E-05	7.65E-05	6.68E-05	8.07E-05
30	Mean	0.26	0.26	0.25	0.25	0.25	0.25	0.25	0.27
30	Std Err	1.23E-04	1.20E-04	1.34E-04	1.03E-04	1.27E-04	1.39E-04	1.24E-04	1.26E-04
40	Mean	0.64	0.65	0.64	0.63	0.64	0.64	0.65	0.64
40	Std Err	1.11E-04	1.20E-04	1.37E-04	9.86E-05	1.35E-04	1.33E-04	1.27E-04	1.16E-04
50	Mean	1.30	1.30	1.32	1.27	1.31	1.31	1.35	1.26
50	Std Err	3.68E-04	3.07E-04	3.59E-04	1.95E-04	2.81E-04	3.62E-04	3.87E-04	4.26E-04
60	Mean	2.32	2.29	2.40	2.25	2.37	2.35	2.47	2.18
60	Std Err	1.17E-03	9.56E-04	1.17E-03	6.87E-04	9.26E-04	1.18E-03	1.24E-03	1.25E-03
70	Mean	3.78	3.69	3.98	3.66	3.91	3.85	4.12	3.48
70	Std Err	2.66E-03	2.17E-03	2.75E-03	1.64E-03	2.20E-03	2.75E-03	2.88E-03	2.73E-03
80	Mean	5.78	5.59	6.16	5.57	6.04	5.91	6.40	5.21
80	Std Err	5.09E-03	4.14E-03	5.36E-03	3.21E-03	4.33E-03	5.33E-03	5.60E-03	5.06E-03
90	Mean	8.40	8.07	9.07	8.07	8.84	8.63	9.46	7.44
90	Std Err	8.71E-03	7.06E-03	9.35E-03	5.56E-03	7.56E-03	9.22E-03	9.74E-03	8.46E-03

**Table 10. Regression results for the slope of male predicted weight at length over time.**

Length (cm)	RMSE	Estimate	Std Err	T value	P Value	Lo 95 CI	Up 95 CI
10	0.0011	4.00E-05	1.70E-04	0.2363	0.8211	-0.0004	0.0005
20	0.0049	1.40E-04	7.60E-04	0.1901	0.8555	-0.0017	0.0020
30	0.0077	2.10E-04	1.18E-03	0.1798	0.8633	-0.0027	0.0031
40	0.0067	1.40E-04	1.03E-03	0.1357	0.8965	-0.0024	0.0027
50	0.0328	-1.50E-04	5.06E-03	-0.0300	0.9771	-0.0125	0.0122
60	0.0985	-7.00E-04	1.52E-02	-0.0459	0.9649	-0.0379	0.0365
70	0.2176	-1.50E-03	3.36E-02	-0.0446	0.9659	-0.0837	0.0807
80	0.4086	-2.50E-03	6.31E-02	-0.0396	0.9697	-0.1568	0.1518
90	0.6919	-3.61E-03	1.07E-01	-0.0338	0.9741	-0.2649	0.2576

**Table 11. Results of length:weight analysis using bootstrap data for females.**  
**A) Parameter estimates, B) Predicted length at age. Weights are in kg.**

A)

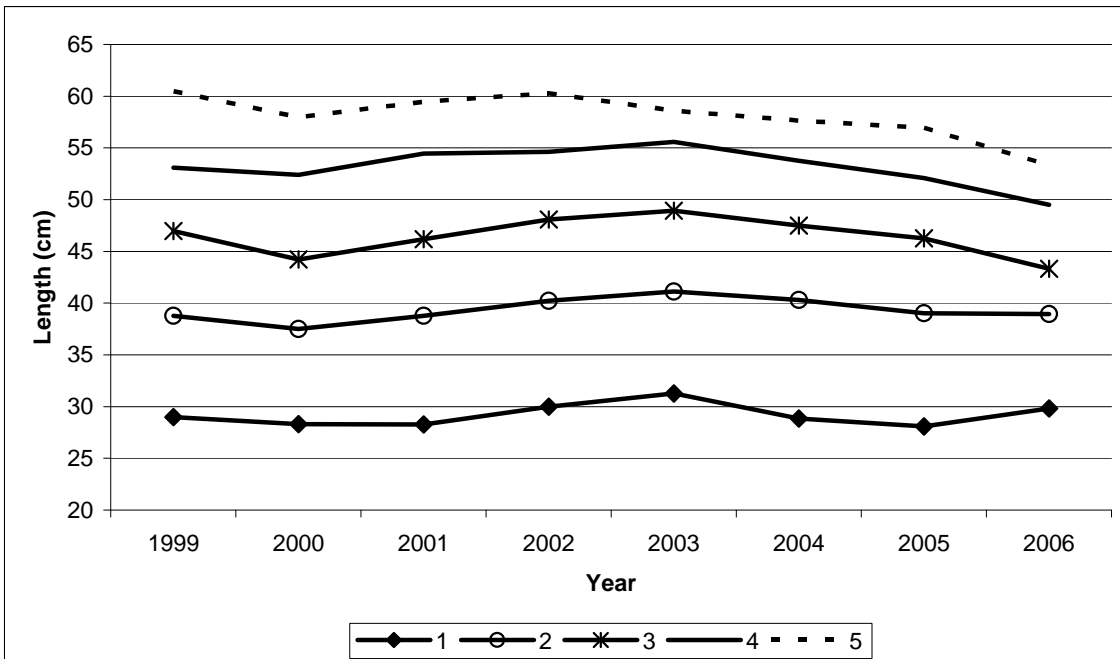
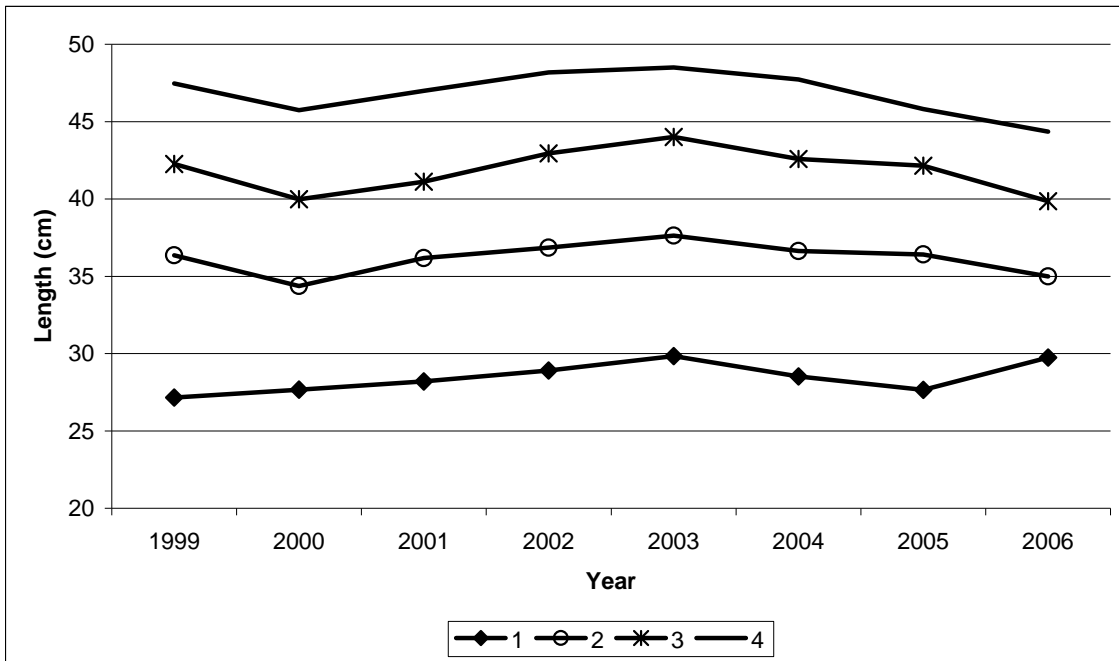
Param		Year							
		1999	2000	2001	2002	2003	2004	2005	2006
a	Mean	2.65E-06	4.60E-06	2.84E-06	4.83E-06	4.00E-06	4.61E-06	3.24E-06	5.12E-06
a	Std Err	1.20E-08	2.20E-08	1.11E-08	1.80E-08	1.92E-08	2.17E-08	2.14E-08	3.85E-08
b	Mean	3.35	3.21	3.33	3.19	3.24	3.21	3.30	3.18
b	Std Err	1.14E-03	1.20E-03	9.68E-04	9.33E-04	1.20E-03	1.18E-03	1.67E-03	1.89E-03

B)

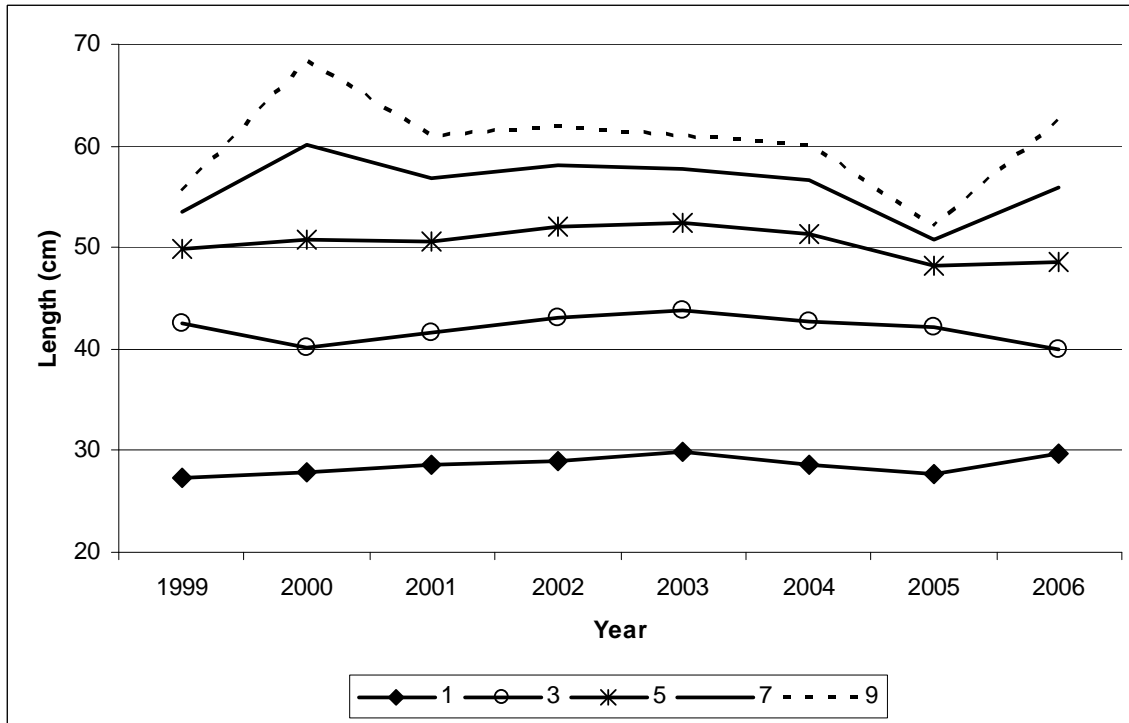
Length (cm)		Year							
		1999	2000	2001	2002	2003	2004	2005	2006
10	Mean	0.0060	0.0074	0.0061	0.0075	0.0069	0.0074	0.0064	0.0077
10	Std Err	1.14E-05	1.49E-05	1.01E-05	1.19E-05	1.42E-05	1.46E-05	1.77E-05	2.35E-05
20	Mean	0.0611	0.0682	0.0612	0.0680	0.0655	0.0681	0.0633	0.0696
20	Std Err	6.91E-05	8.15E-05	6.11E-05	6.48E-05	8.01E-05	7.91E-05	1.01E-04	1.21E-04
30	Mean	0.2381	0.2504	0.2361	0.2478	0.2437	0.2496	0.2413	0.2525
30	Std Err	1.62E-04	1.80E-04	1.44E-04	1.44E-04	1.81E-04	1.72E-04	2.23E-04	2.49E-04
40	Mean	0.6250	0.6299	0.6156	0.6203	0.6189	0.6278	0.6236	0.6304
40	Std Err	2.30E-04	2.44E-04	2.13E-04	2.01E-04	2.55E-04	2.30E-04	2.90E-04	2.99E-04
50	Mean	1.3212	1.2885	1.2948	1.2639	1.2756	1.2840	1.3027	1.2819
50	Std Err	2.33E-04	2.23E-04	2.19E-04	1.92E-04	2.44E-04	2.14E-04	2.58E-04	3.12E-04
60	Mean	2.4357	2.3124	2.3768	2.2609	2.3031	2.3037	2.3783	2.2896
60	Std Err	4.91E-04	4.46E-04	3.68E-04	3.26E-04	4.24E-04	4.85E-04	7.58E-04	9.96E-04
70	Mean	4.0852	3.7914	3.9723	3.6969	3.7957	3.7765	3.9564	3.7389
70	Std Err	1.39E-03	1.30E-03	1.04E-03	9.35E-04	1.24E-03	1.37E-03	2.17E-03	2.61E-03
80	Mean	6.3940	5.8186	6.1982	5.6602	5.8512	5.7948	6.1487	5.7181
80	Std Err	3.07E-03	2.86E-03	2.34E-03	2.08E-03	2.77E-03	2.95E-03	4.69E-03	5.36E-03
90	Mean	9.4927	8.4900	9.1770	8.2416	8.5711	8.4540	9.0718	8.3180
90	Std Err	5.77E-03	5.33E-03	4.46E-03	3.89E-03	5.22E-03	5.44E-03	8.66E-03	9.61E-03

**Table 12. Regression results for the slope of female predicted weight at length over time.**

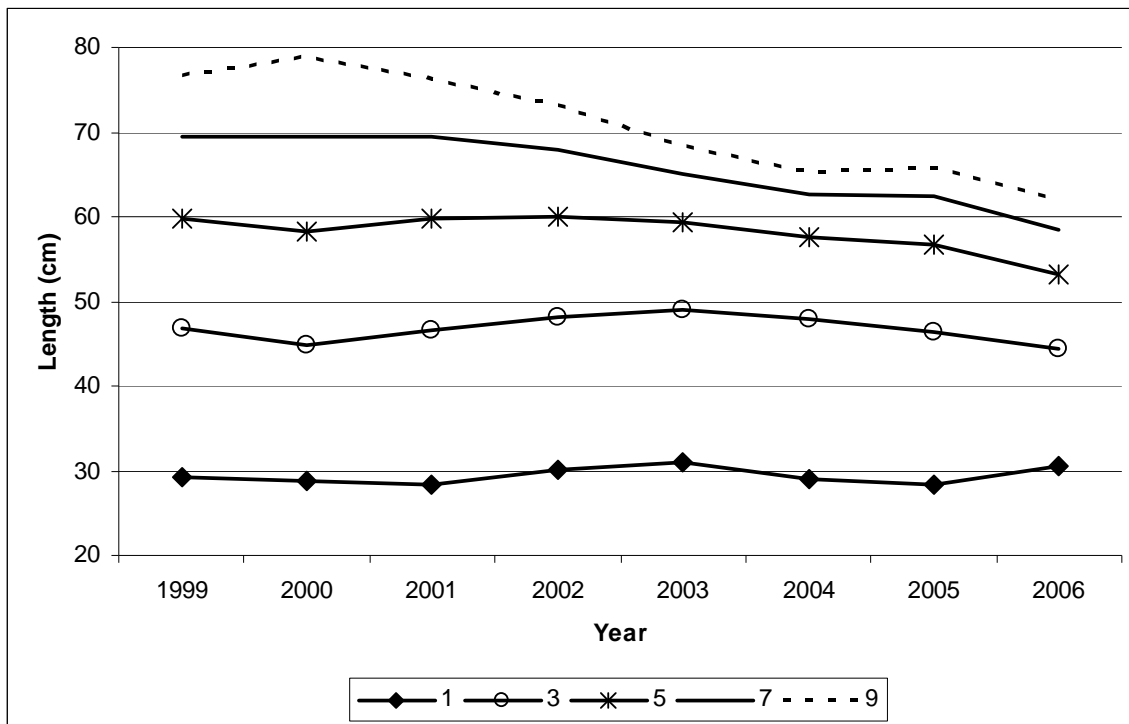
Length (cm)	RMSE	Estimate	Std Err	T value	P Value	Lo 95 CI	Up 95 CI
10	0.0006	1.30E-04	1.00E-04	1.2622	0.2537	-0.0001	0.0004
20	0.0032	6.30E-04	5.00E-04	1.2579	0.2552	-0.0006	0.0019
30	0.0059	1.09E-03	9.00E-04	1.2101	0.2717	-0.0011	0.0033
40	0.0056	5.00E-04	8.70E-04	0.5741	0.5868	-0.0016	0.0026
50	0.0176	-2.67E-03	2.71E-03	-0.9873	0.3616	-0.0093	0.0040
60	0.0567	-1.04E-02	8.74E-03	-1.1845	0.2810	-0.0318	0.0110
70	0.1312	-2.49E-02	2.02E-02	-1.2280	0.2655	-0.0744	0.0247
80	0.2540	-4.88E-02	3.92E-02	-1.2453	0.2594	-0.1447	0.0471
90	0.4399	-8.52E-02	6.79E-02	-1.2546	0.2563	-0.2513	0.0809



**Figure 1. Mean length at age for males age 1 to 4 (top) and females age 1 to 5.**



**Figure 2. Mean predicted length at age for selected ages of males.**



**Figure 3. Mean predicted length at age for selected ages of females.**



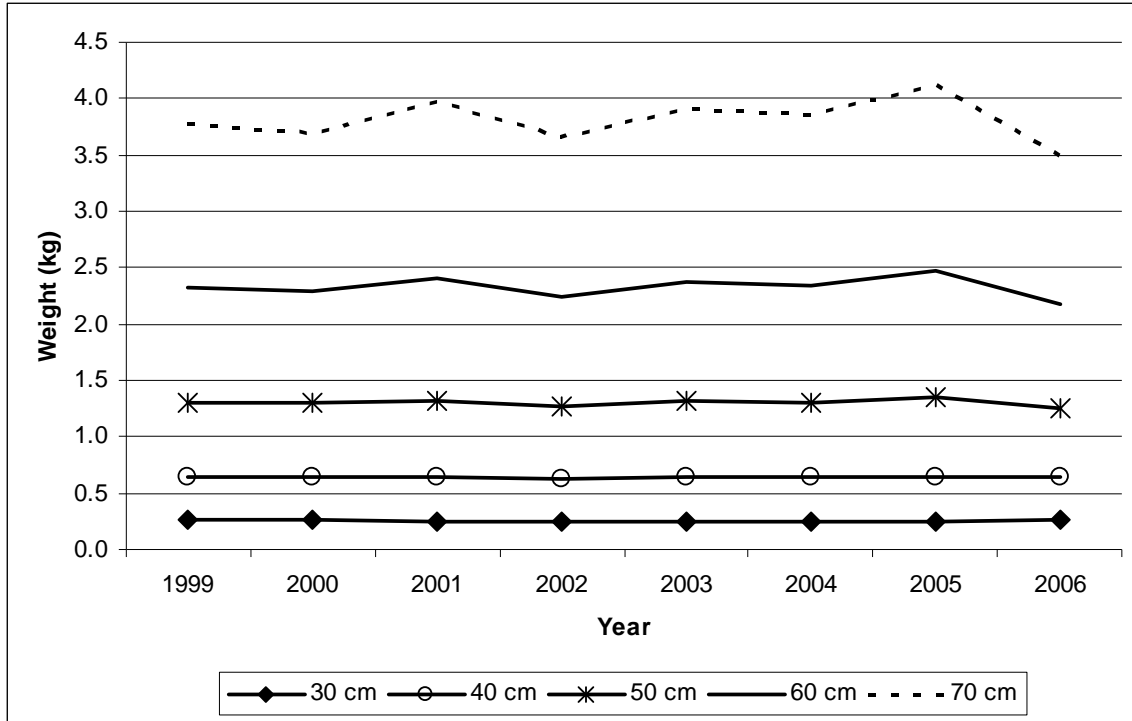


Figure 4. Mean predicted weight at length for selected lengths of males.

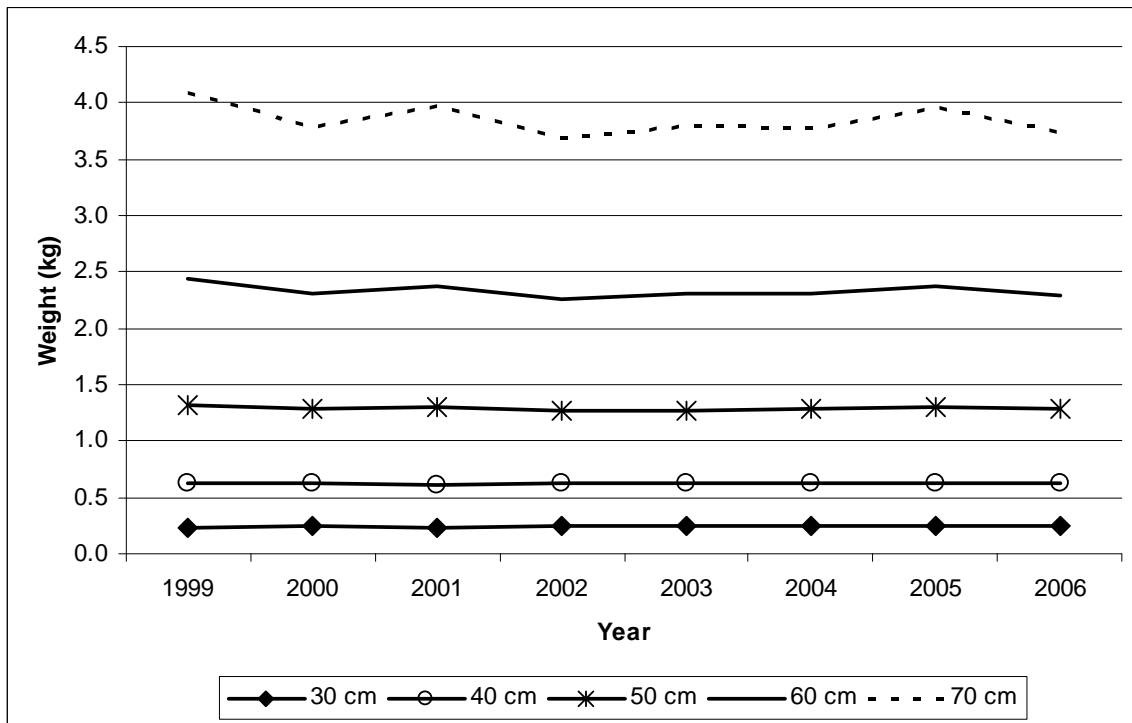
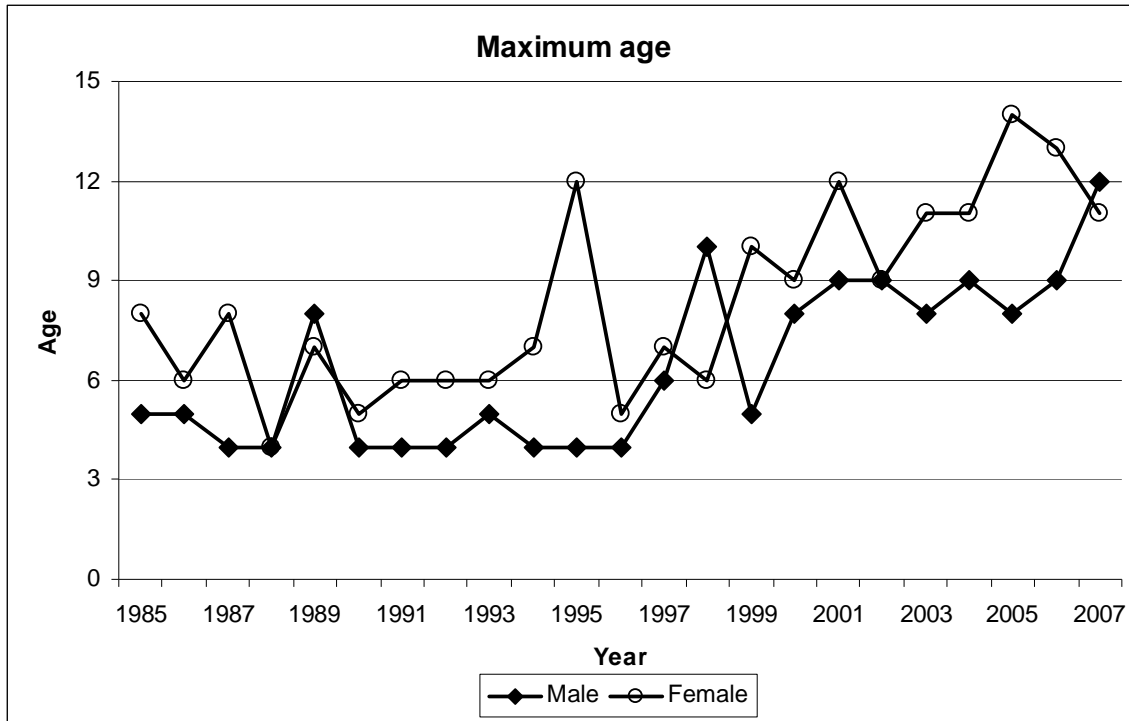
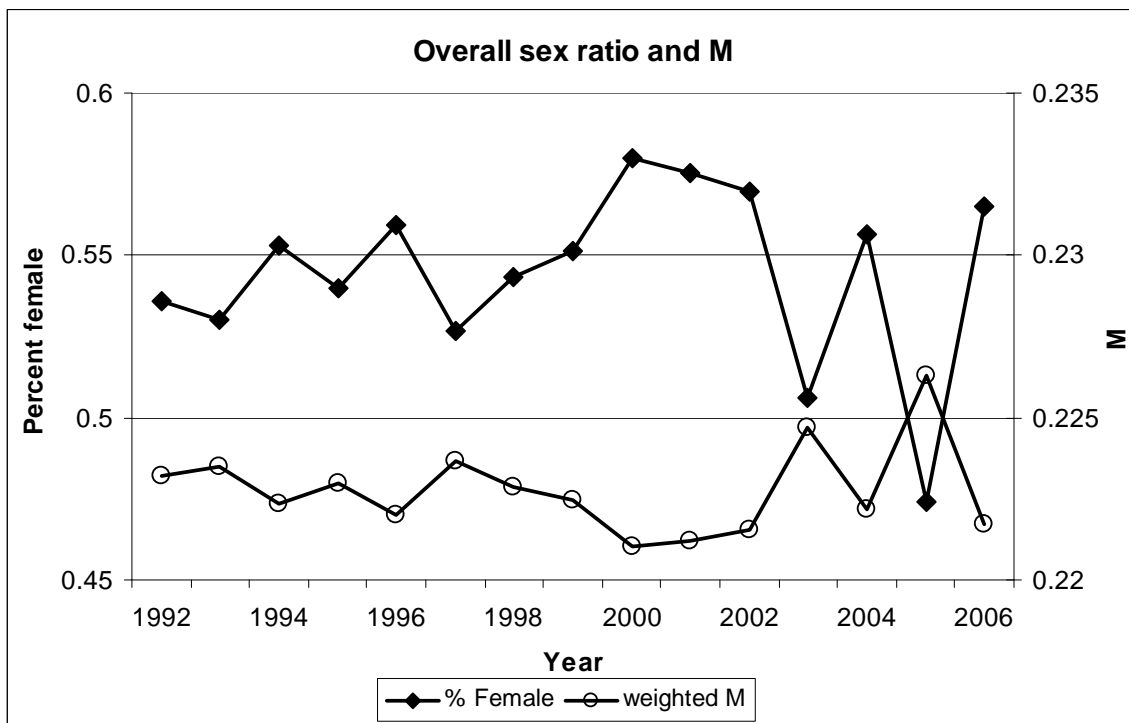


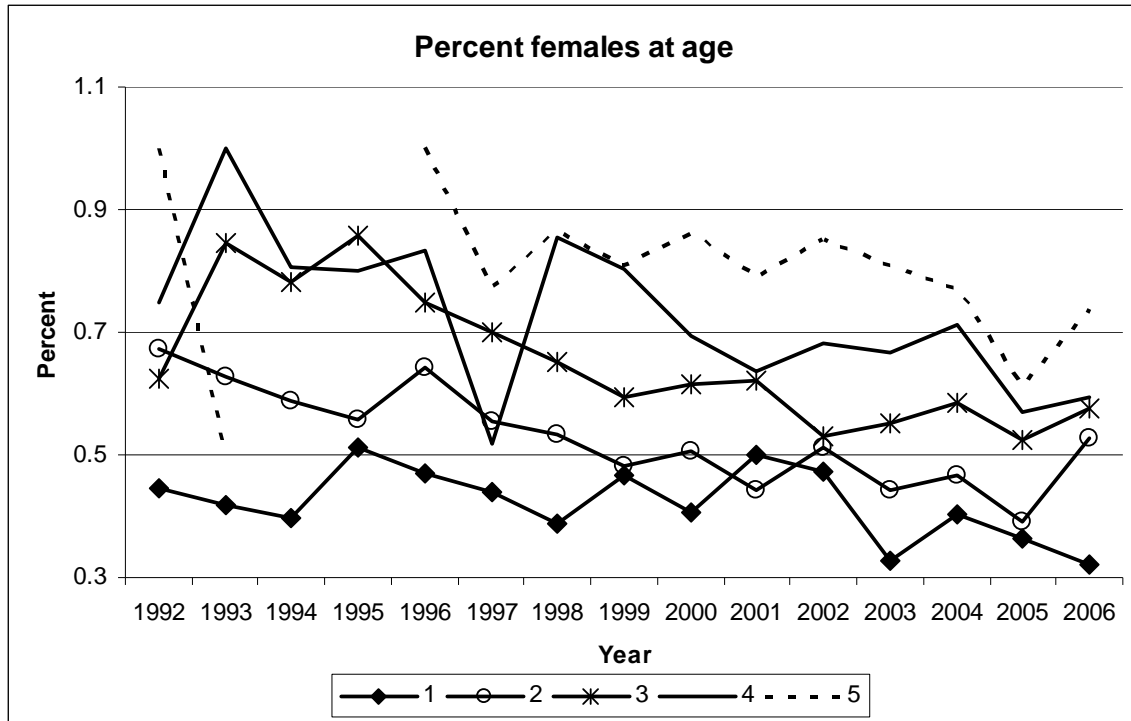
Figure 5. Mean predicted weight at length for selected lengths of females.



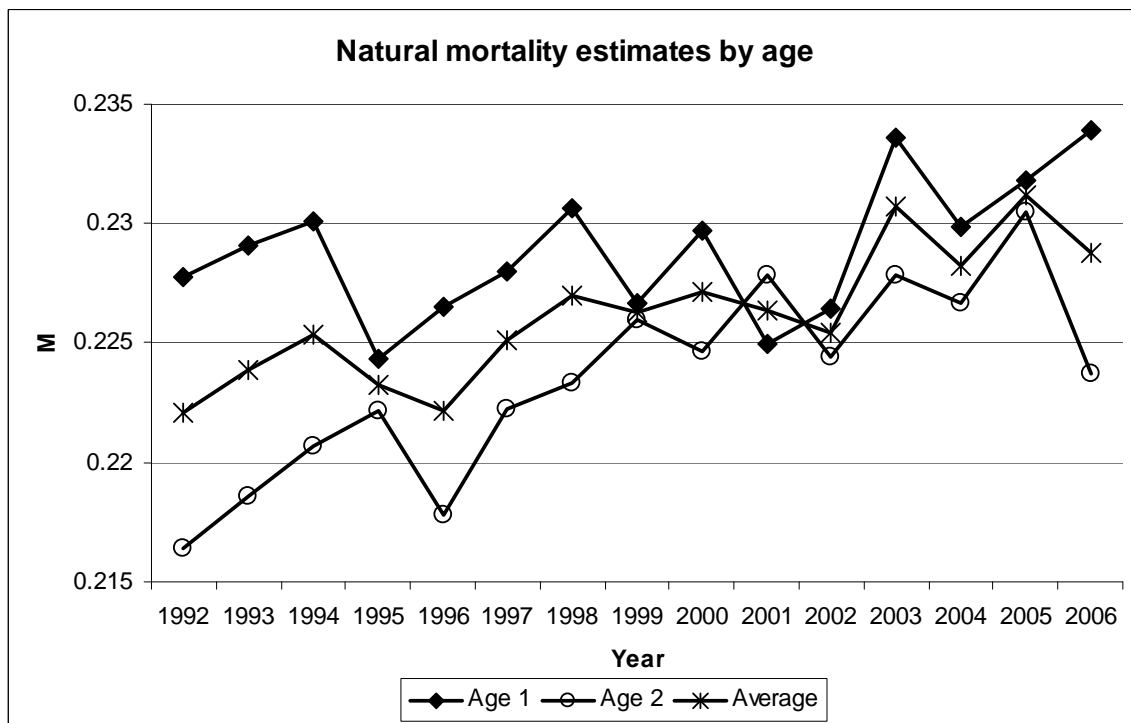
**Figure 6. Observed maximum age by sex in NEFSC trawl surveys.**



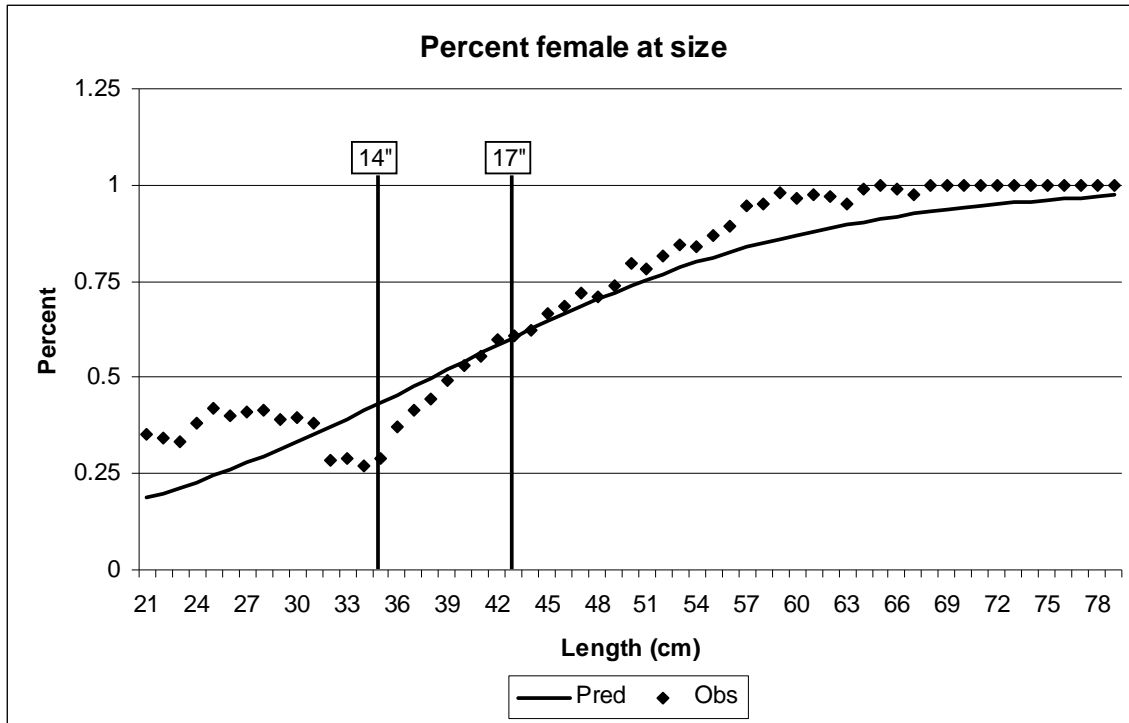
**Figure 7. Sex ratio and natural mortality estimate by year across all ages.**



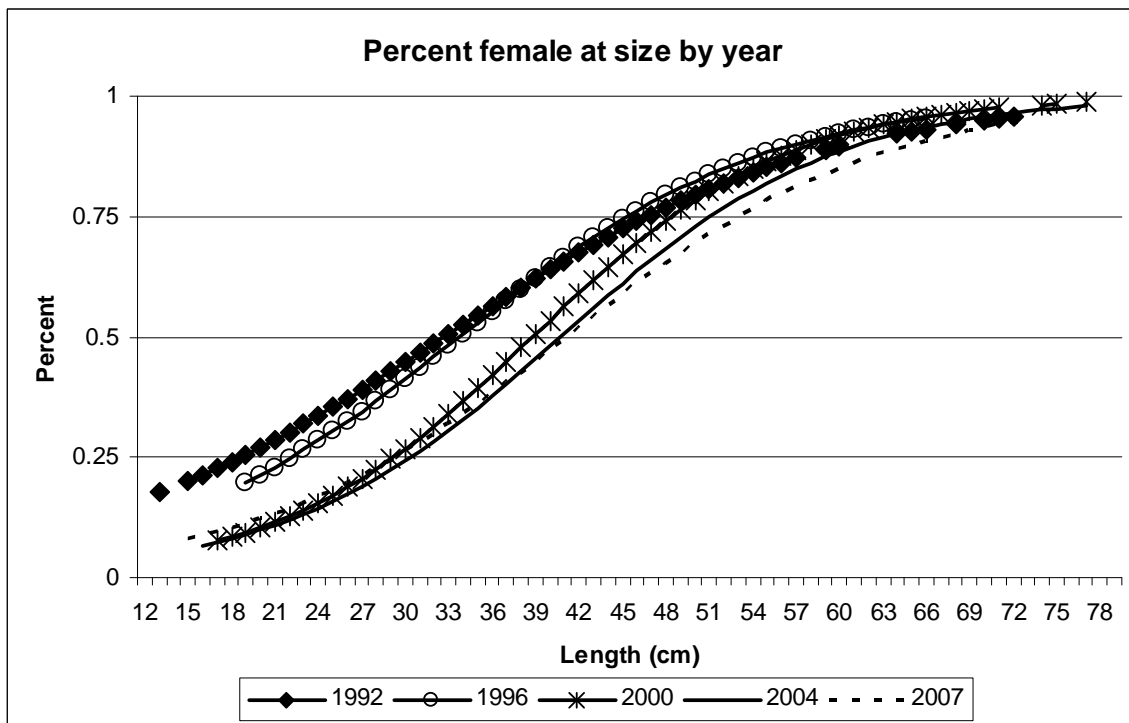
**Figure 8. Percent female at age for selected ages.**



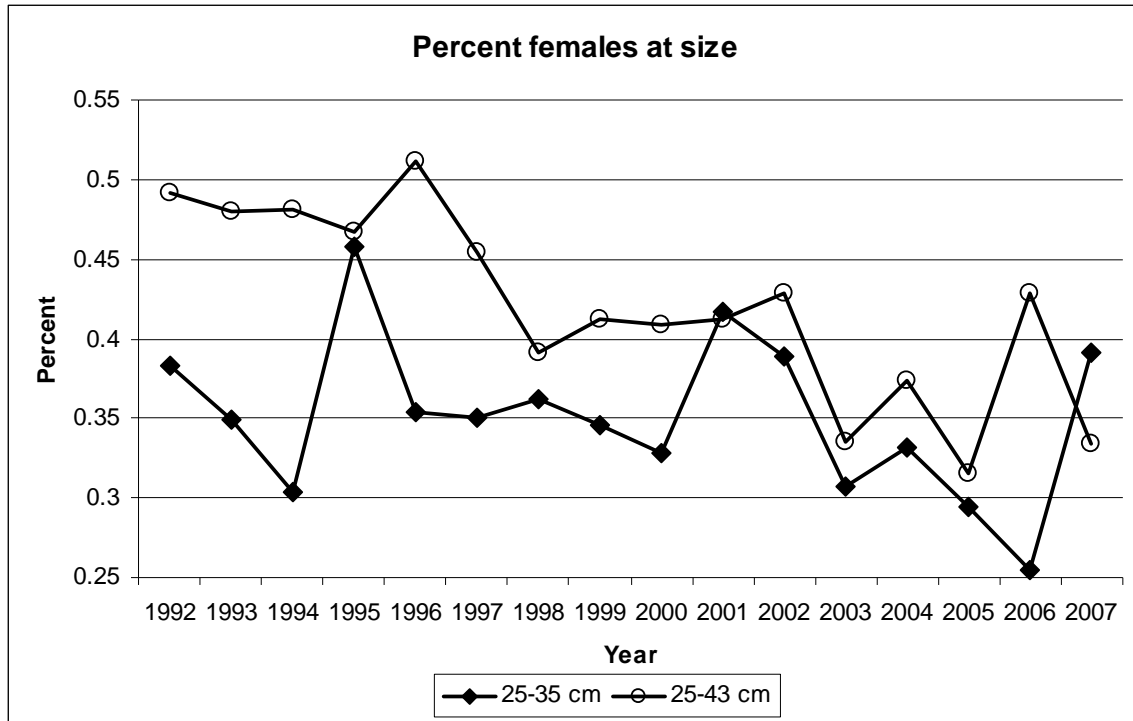
**Figure 9. Natural mortality estimates by age for 1 and 2 year old fish**



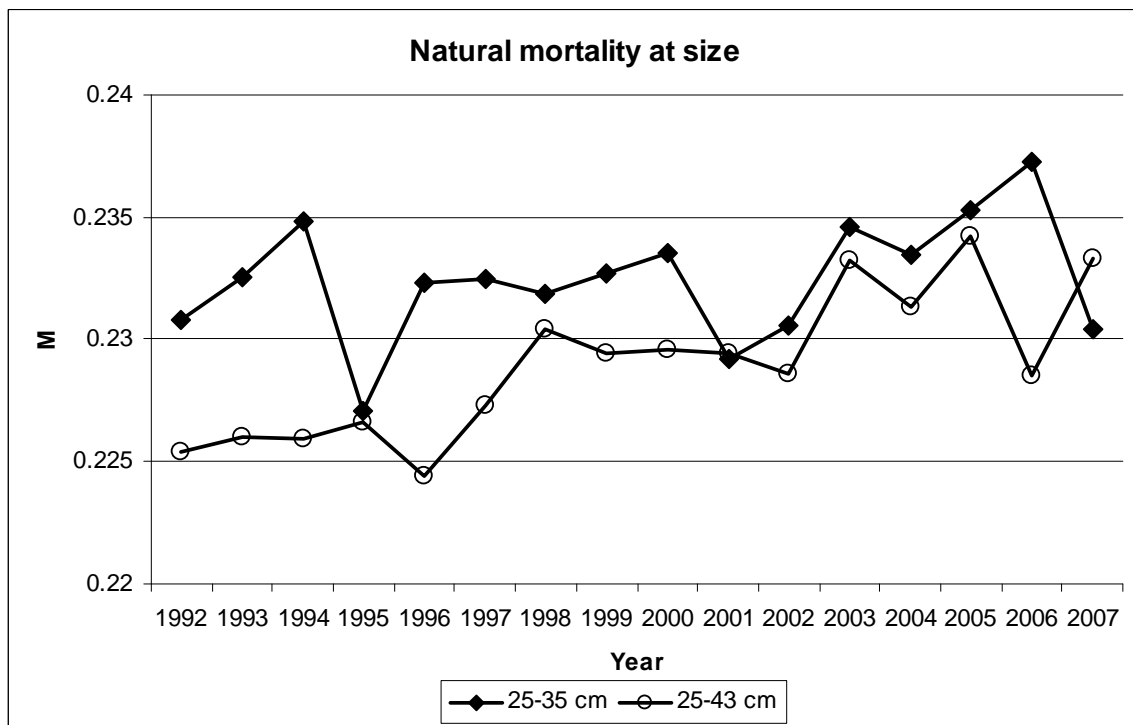
**Figure 10. Logistic regression of percent female at size for all years combined.**



**Figure 11. Logistic regression of percent female at size by year for selected years.**



**Figure 12. Percent female by year for two different size classes.**



**Figure 13. Natural mortality estimates for two different size groups.**

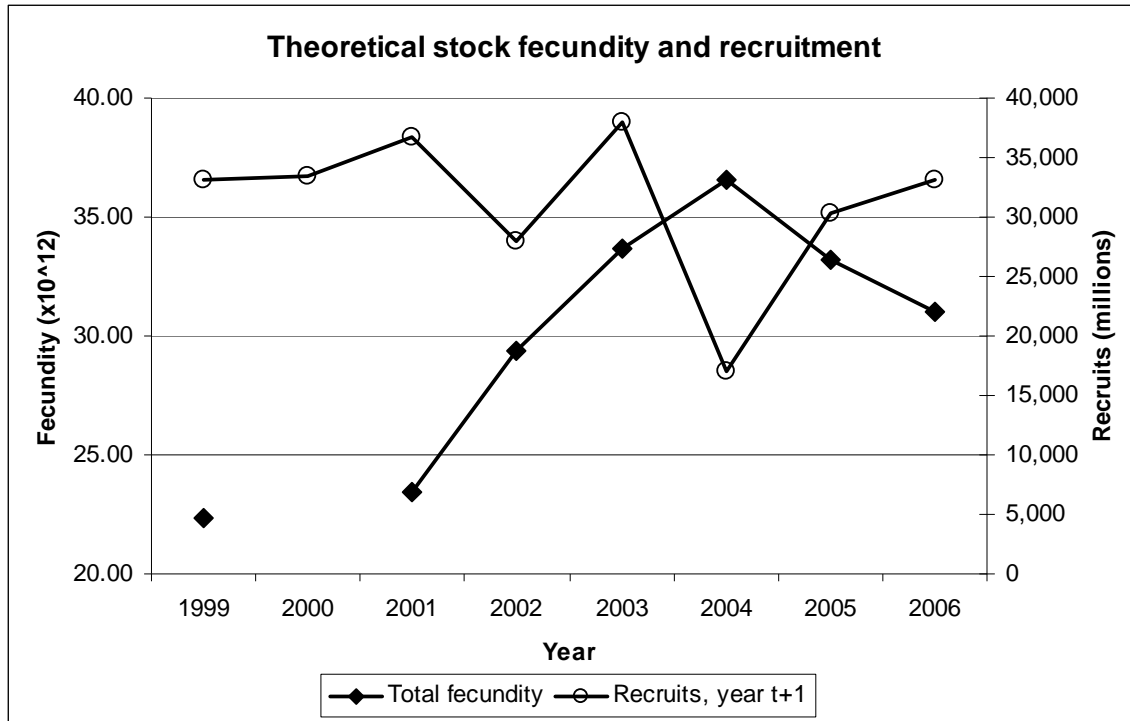


Figure 14. Overall fecundity and recruitment.

**SAW 47 Working Paper 8 (TOR 3) – Natural Mortality**  
**A Review of Natural Mortality of Summer Flounder**  
**Rich Wong**

This report is a short review of the common models used to estimate natural mortality rates  $M$  for use in population dynamics modeling. The natural mortality models were categorized as either longevity- or life-history based estimators of  $M$ . Sex and age-specific estimates of  $M$  are given in Tables 1-3, calculated from model inputs from current summer flounder age and growth data (1976-2007) from the NMFS trawl survey.

**Longevity-Based Estimators of Natural Mortality**

Longevity-based estimators of natural mortality are derived from the underlying mathematical

function describing population decline,  $\frac{N_t}{N_0} = e^{-Zt}$ . For unexploited stocks, 1)  $Z = M$ , and 2)

$\frac{N_t}{N_0}$  approaches zero as  $t$  approaches a stock's maximum longevity. This is the basis for the rule

of thumb (ROT) equation,  $M = \frac{-\ln(P)}{t_{\max}}$ . Only two variables, therefore, affect  $M$  given this ROT

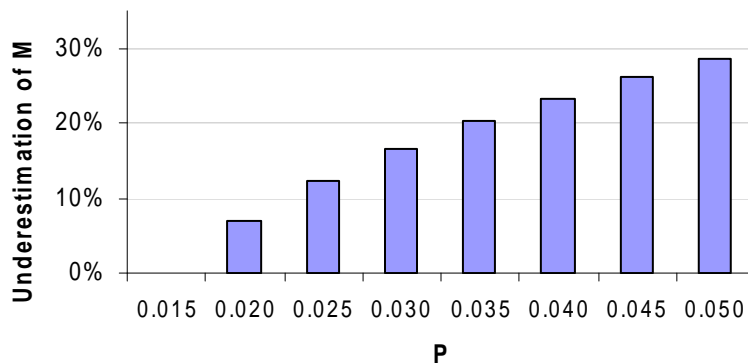
expression, 1)  $P$ , which represents some small proportion of the population that survives to a given maximum age, and 2)  $t_{\max}$ , which should represent the maximum longevity of the stock (Hewitt and Hoenig 2005). The value of  $P$  is often set equal to 5% for population modeling purposes (e.g. blue crabs, summer flounder, tautog, bluefish, etc.) resulting in a more simplified

expression,  $M = \frac{\ln(0.05)}{t_{\max}} \approx \frac{3}{t_{\max}}$ . However, aside from its common use in assessments, the value

of  $P = 5\%$  is not well supported by data (Hewitt and Hoenig 2005). Recently, Hewitt and Hoenig (2005) recommended a more empirically supported value of  $P = 1.5\%$  based on a regression of  $Z$  and maximum observed age from 134 unexploited fish, mollusk, and cetacean stocks in earlier work by Hoenig (1983). Hoenig's (1983) regression,  $\ln(Z) = 1.44 - 0.982 \ln(t_{\max})$ ,

can be rearranged as  $Z = \frac{e^{1.44}}{t_{\max}^{0.982}} \approx \frac{4.22}{t_{\max}}$ . Ergo, P roughly equals 1.5% from the equation,  $\ln(P) =$

-4.22. Estimates of M using the 5% ROT are 29% lower than the estimates from P = 1.5% (Figure 1). Predictably, outputs from population models are highly sensitive to estimates of M. Lower M inputs typically result in lower abundance estimates from population modeling and lower benchmarks from YPR analysis.

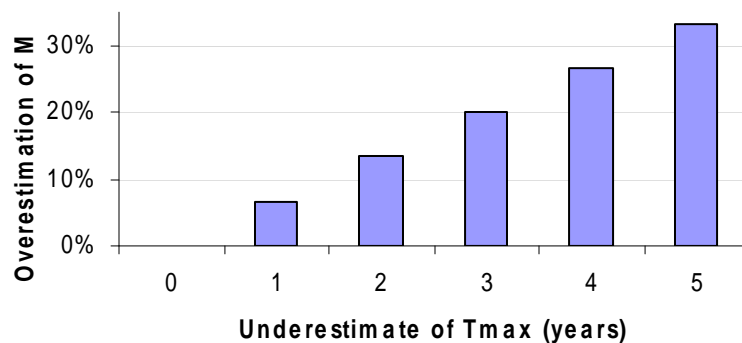


**Figure 1. Underestimation of M relative to P = 1.5%.**

In addition to the critical importance of P, using a maximum observed age collected from a highly exploited stock produces a biased underestimate of longevity and is in direct violation of the longevity-based M paradigm. As an example of how the maximum observed age can change over a short time period, the maximum observed age of Atlantic croaker increased from 6 to 12 since the early 1990s from age and growth studies in North Carolina, mirroring an increase in stock abundance over this period (pers. comm. R. Gregory, age/growth biologist NC Division of Marine Fisheries). If  $t_{\max}$  were solely based on these age samples, the resulting estimates of M (using the 1.5% ROT) would have declined from 0.70 to 0.35 in less than 20 years. Despite the recent occurrence of older age classes, no specimen has yet been observed at the maximum age of 15 y recorded from scattered otoliths found in archaeological shell middens from a period of minimal exploitation (Hales and Reitz 1992).



The underestimation of longevity is a legitimate concern for stocks whose  $t_{\max}$  is observed during a period of heavy exploitation. For example, for summer flounder at the current  $t_{\max} = 15$ , the effect of potentially underestimating longevity by 1 to 5 years results in an overestimation of  $M$  by 6 to 32% (Figure 2). On the other hand, the consequence of using a  $P$  value up to 5% is the 29% reduction in  $M$  from the 1.5% ROT supported by Hoenig (1983) (Figure 1). The widespread use of  $P = 5\%$  for stock assessment purposes, whether intentional or not, automatically accounts for an assumed  $\sim 4$  year underestimation of longevity (assuming that  $P = 1.5\%$  is the proper  $P$  value for the longevity-based ROT).

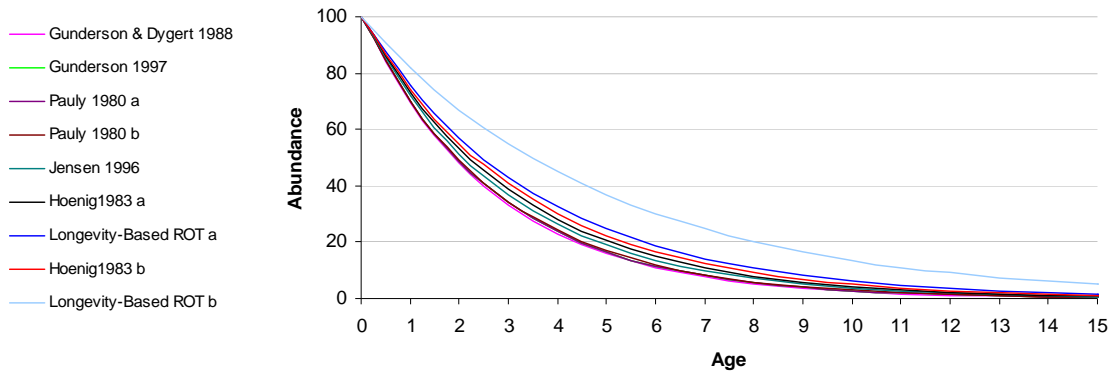


**Figure 2. Effect of underestimating longevity by up to 5 years for summer flounder.**

### **Life-History Based Estimators of Natural Mortality**

Other methods of estimating  $M$  are based on specific life history characteristics from the species in question (Table 1; Figure 3). Pauly (1980) described  $M$  using von Bertalanffy growth parameters ( $L_{\text{inf}}$ ,  $K$ ) and water temperature based on data of 175 fish stocks. Jensen (1996) provides a modification of Pauly's (1980) model based solely on the correlation between  $M$  and  $K$ , providing the basis for the simplified equation,  $M = gK$ . The coefficient  $g$  was estimated as 1.598 ( $r^2 = 0.72$ ) based on Pauly's (1980) data (Jensen 1996). Gunderson (1997) showed that  $M$

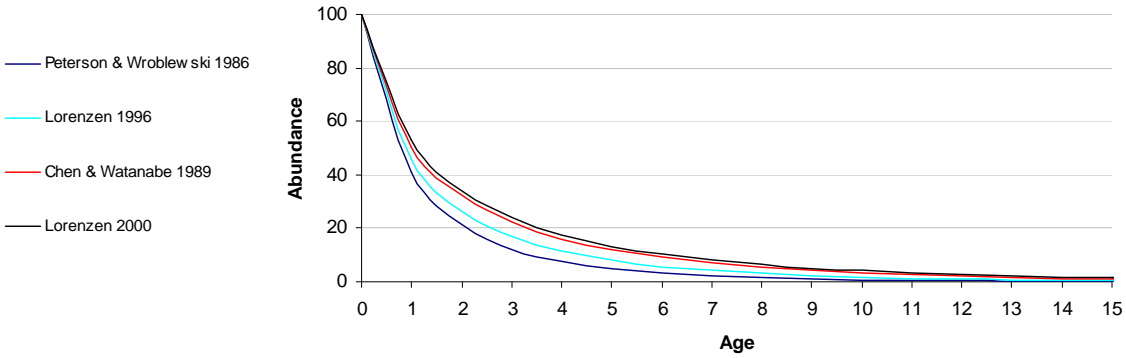
could be predicted from reproductive effort from data of 28 fish stocks by the linear regression,  $M = 1.79 * GSI$  ( $r^2 = 0.75$ ). Variance of these life-history based estimates of M can be calculated given the known variances of model inputs (Gunderson et al. 2002).



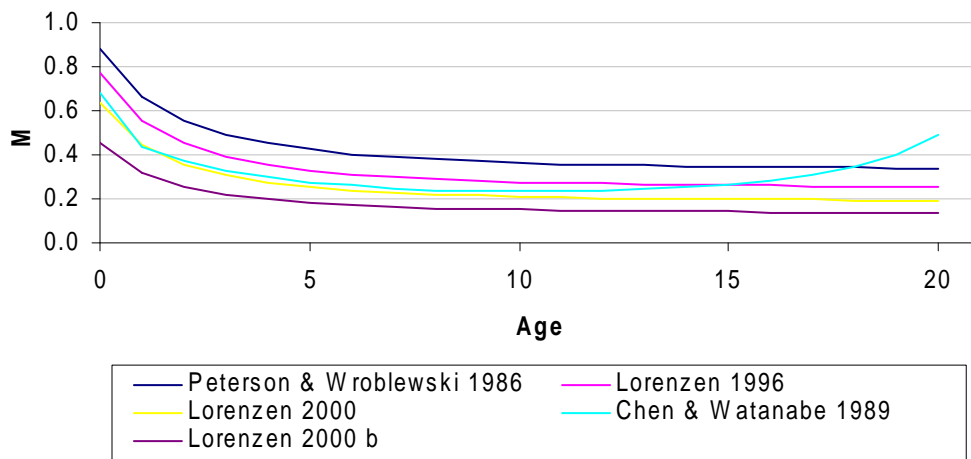
**Figure 3. Survival curves from constant M estimates.**

Other life-history based estimators of M provide for size-specific or age-based natural mortality rates (Tables 2, 3; Figures 4, 5, 6). Peterson and Wroblewski (1984) describe an inverse relationship between M and dry weight for juvenile and adult fishes. McGurk (1986) complemented this model by describing a steeper inverse M-dry weight relationship specific to fish eggs and larvae based on the linear regression of  $\ln(M)$  and  $\ln(\text{dry weight})$  ( $r = 0.58$ ,  $P < 0.001$ ). Lorenzen (1996) describes a similar allometric relationship between body weight and natural mortality in juvenile and adult fish across different ecosystems. All of these size-dependent M rates can also be expressed as age-dependent M rates with necessary age and growth data. Chen and Watanabe (1989) estimate age-specific M rates based on known LVB growth parameters, accounting for higher natural mortality rates at early and senescent life history stages. Use of Lorenzen's (2000) approach, which is based on an allometric relationship between body length and M, combined with an assumption of longevity (ala the aforementioned

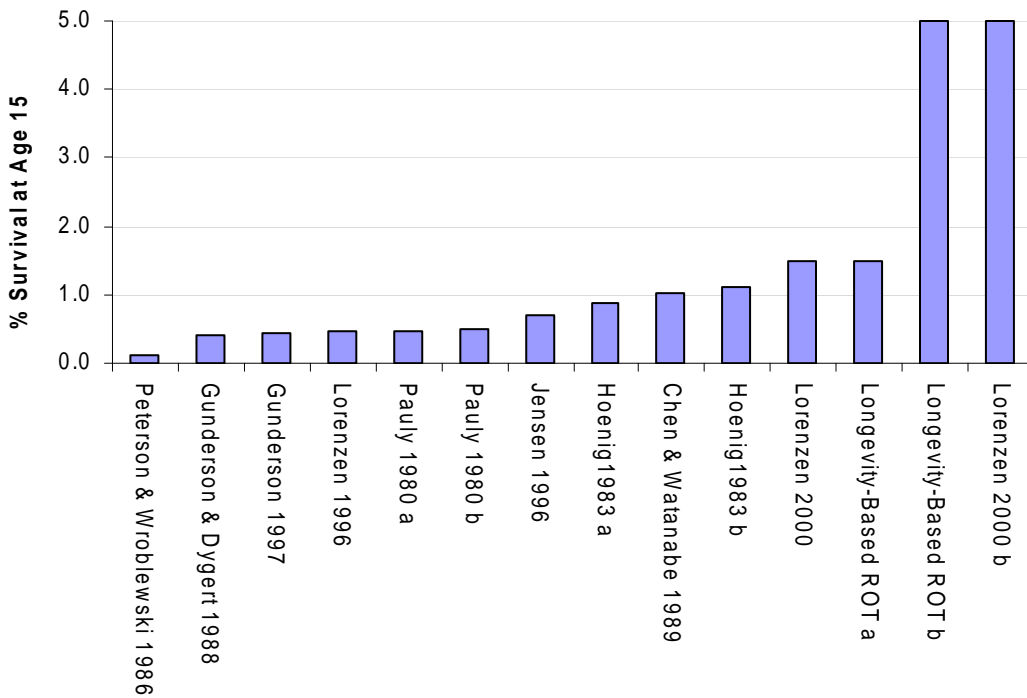
longevity-based ROTs) can provide for somewhat of a hybrid age-dependent-longevity-based natural mortality model (pers. comm. L. Brooks, NMFS).



**Figure 4. Survival curves from age-specific M estimates.**

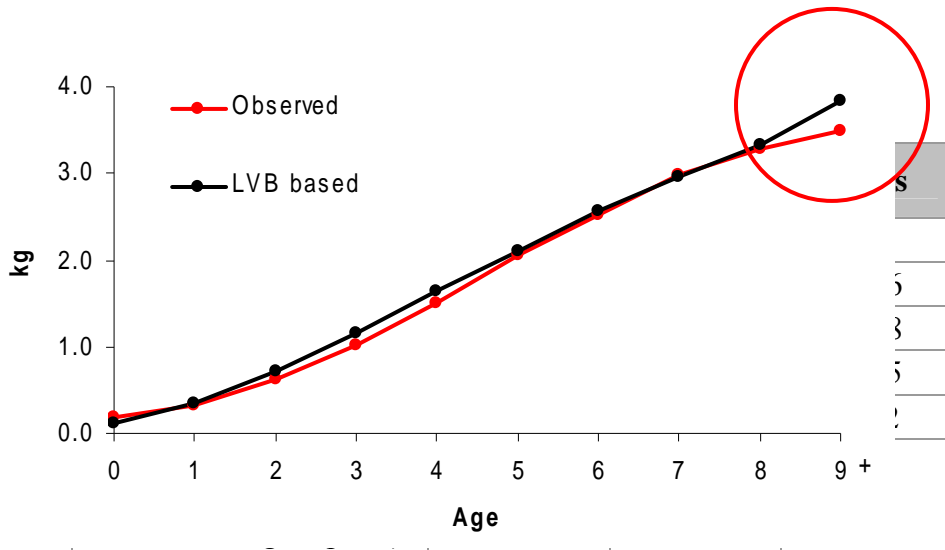


**Figure 5. Age-specific M rates. Lorenzen 2000 is based on the 1.5% ROT, Lorenzen 2000 b is based on the 5% ROT.**



**Figure 6. Percent survival at age = 15y.**

Male-to-female demographics are very important considerations when combined-sex M rates are calculated. For example, size-at-age inputs for M models will likely differ from a combined-sex LVB growth trajectory versus the sex-weighted mean size-at-age observed in the population (Figure 6), resulting in potentially different M rates. Also, the time step chosen for calculating age-based M estimates can be influential particularly when estimates of natural mortality are much higher at early life stages. For example, survival after one year is 46% using a 1 year time step versus 44% using a 1/4 year step from size-based M rates calculated from the Lorenzen (1996) model (using the size at the mid-point of each time step).



**Figure 7. Observed mean weight-at-age from the NMFS trawl survey versus weight-at-age based on LVB length-at-age and L:W relationship.**

**Table 1. Estimates of constant natural mortality rates for summer flounder.**

<b>Model</b>	<b>Formula</b>	<b>M (combined- sex)</b>	<b>M (females)</b>	<b>M (males)</b>
Hoenig (1983)	$Z = \exp(1.44-0.982*\ln(tmax))$ ; 134 mixed stocks	0.295	0.295	0.340
	$Z = \exp(1.46-1.01*\ln(tmax))$ ; 84 fish stocks	0.279	0.279	0.323
Longevity-Based ROTs	$Z = \ln(1.5\%)/tmax$ or $4.22/tmax$	0.280	0.280	0.323
	$Z = \ln(5\%)/tmax$ or $3/tmax$	0.200	0.200	0.230
Pauly (1980)	$\ln(M) = -0.0066-0.279*\ln(Linf)+0.6543*\ln(K)+0.4634*\ln(T)$	0.358	0.419	0.452
	$\ln(M) = -0.0152-0.279*\ln(Linf)+0.6543*\ln(K)+0.4634*\ln(T)$	0.355	0.416	0.448
Jensen (1996)	$M = gK$ ; $g = 1.598$	0.331	0.414	0.428
Gunderson & Dygert (1988)	$M = 0.03 + 1.68*GSI$		0.368	
Gunderson (1997)	$M = 1.79*GSI$		0.360	

**Table 2. Age or size-based estimates of M.**

Inputs	Combined-sex	Females	Males	Model	Formula
Maximum Observed Age	15	15	13	Peterson & Wroblewski 1984	$M^d = 5.26 \cdot (10^{-3}) \cdot W^{-0.25}$
K	0.207	0.259	0.268	Chen & Watanabe 1989	$M1 = K / (1 - \text{EXP}(-K \cdot (t-t_0)))$ ; early life stages
L <sub>inf</sub>	76.95	73.97	61.15		$M2 = K / (a_0 + a_1 \cdot (t-t_m) + a_2 \cdot (t-t_m)^2)$ ; senescence
T0	-1.24	-0.92	-1.32	Lorenzen 1996	$M = 3.00 \cdot W^{(-2.88)}$
L:W Parameter a	4.08E-06	3.68E-06	4.51E-06	Lorenzen 2000	$M = Mr \cdot (Lr/Lt)$ , assuming 1.5% survival ROT
L:W Parameter b	3.241	3.266	3.218		
a0	0.773	0.787	0.702		
a1	0.047	0.055	0.080		
a2	-4.87E-03	-7.13E-03	-1.07E-02		
Lr	33.35	34.48	32.43		
Mr	0.443	0.434	0.456		

**Table 3. Age-variable M rates for fluke.**

Age	Lorenzen 2000			Lorenzen 1996			Chen & Watanabe 1989			Peterson & Wroblewski 1986		
	Combined-sex	Females	Males	Combined-sex	Females	Males	Combined-sex	Females	Males	Combined-sex	Females	Males
0	0.634	0.656	0.627	0.775	0.796	0.759	0.685	0.840	0.694	0.886	0.908	0.871
1	0.443	0.434	0.456	0.554	0.540	0.566	0.441	0.516	0.500	0.663	0.648	0.675
2	0.356	0.344	0.378	0.452	0.434	0.475	0.373	0.432	0.418	0.555	0.536	0.580
3	0.307	0.297	0.334	0.393	0.377	0.423	0.329	0.378	0.369	0.492	0.475	0.525
4	0.276	0.268	0.306	0.356	0.343	0.391	0.298	0.343	0.340	0.452	0.437	0.490
5	0.255	0.250	0.288	0.331	0.321	0.370	0.275	0.320	0.323	0.424	0.412	0.466
6	0.240	0.237	0.276	0.313	0.305	0.355	0.260	0.304	0.316	0.404	0.395	0.450
7	0.229	0.228	0.267	0.300	0.295	0.344	0.248	0.295	0.316	0.389	0.383	0.439
8	0.221	0.222	0.261	0.290	0.287	0.337	0.241	0.290	0.325	0.378	0.374	0.430
9	0.215	0.217	0.256	0.283	0.281	0.331	0.236	0.291	0.343	0.369	0.368	0.424
10	0.210	0.213	0.253	0.277	0.277	0.327	0.234	0.296	0.375	0.363	0.363	0.419
11	0.207	0.211	0.250	0.272	0.274	0.324	0.235	0.306	0.427	0.357	0.359	0.416
12	0.204	0.209	0.248	0.269	0.271	0.322	0.238	0.323	0.516	0.353	0.356	0.413
13	0.202	0.207	0.247	0.266	0.269	0.320	0.244	0.348	0.688	0.350	0.354	0.411
14	0.200	0.206	0.246	0.263	0.268	0.319	0.254	0.386	1.124	0.347	0.353	0.410
15	0.198	0.205	0.245	0.262	0.267	0.318	0.267	0.443	4.066	0.345	0.351	0.409
16	0.197	0.205	0.244	0.260	0.266	0.317	0.286	0.536		0.344	0.350	0.408
17	0.196	0.204	0.244	0.259	0.265	0.316	0.312	0.703		0.342	0.350	0.407
18	0.195	0.204	0.243	0.258	0.265	0.316	0.350	1.085		0.341	0.349	0.407
19	0.195	0.203	0.243	0.257	0.264	0.315	0.404	2.727		0.340	0.349	0.406
20	0.194	0.203	0.243	0.257	0.264	0.315	0.491			0.340	0.348	0.406
21							0.643					
22							0.974					
23							2.222					



## SAW 47 Working Paper 9 (TOR 3) – Analysis of Sex Ratios

### **Analysis of Trends in Sex Ratio, Implications for Natural Mortality, and Variation in Age-Length Keys in Summer Flounder**

Eric N. Powell  
Jason Morson

Haskin Shellfish Research Laboratory  
Rutgers University

#### **Introduction**

The analyses described herein use the biological database for summer flounder. The goals of these analyses are to answer the following questions to the extent permitted by this database.

1. Does information exist in the sex-ratio data that would support the need to construct a sex-explicit model for summer flounder?
2. Does information exist in the sex-ratio data that would support the need to utilize regionally-specific sex-at-age keys?
3. Does information exist in the sex-ratio data that would support a differential natural mortality rate for male and female summer flounder or a nonlinear whole-stock natural mortality rate?
4. Does variation exist in the relationship of size and age that would support the need to utilize regionally-specific age-length keys?

#### **Sex Ratio as a Function of Age**

#### **Methods and Results**

Sex ratio data for young-of-the-year are not available prior to 1982; consequently analyses of sex ratio focus on 1982-2007. Due to data limitations, and regional variability in sex ratios as discussed in a subsequent section, we exclude data from southern New England north and also from Cape Hatteras south in this set of analyses. We also exclude all age-year combinations where the number of sexed summer flounder is less than 20. For some analyses, we have collected the data into six year groups with the central four being half-decadal. Year group 1 contains data from 1982-1985 and year group six for 2006-2007.

Table 1 shows the sex ratio by year and age for summer flounder. The year-group averages are in Table 2. Perusal of Table 1 elucidates two general trends.

First, the young-of-the-year are dominantly male. A female-biased sex ratio for young-of-the-year summer flounder occurs only thrice in 26 years, a frequency significantly different than the expected 50:50 split (binomial test,  $P < 0.0005$ ). Furthermore, the fraction male for young-of-the-year fish frequently exceeds 0.6; in fact a sex ratio at least this divergent from 50:50

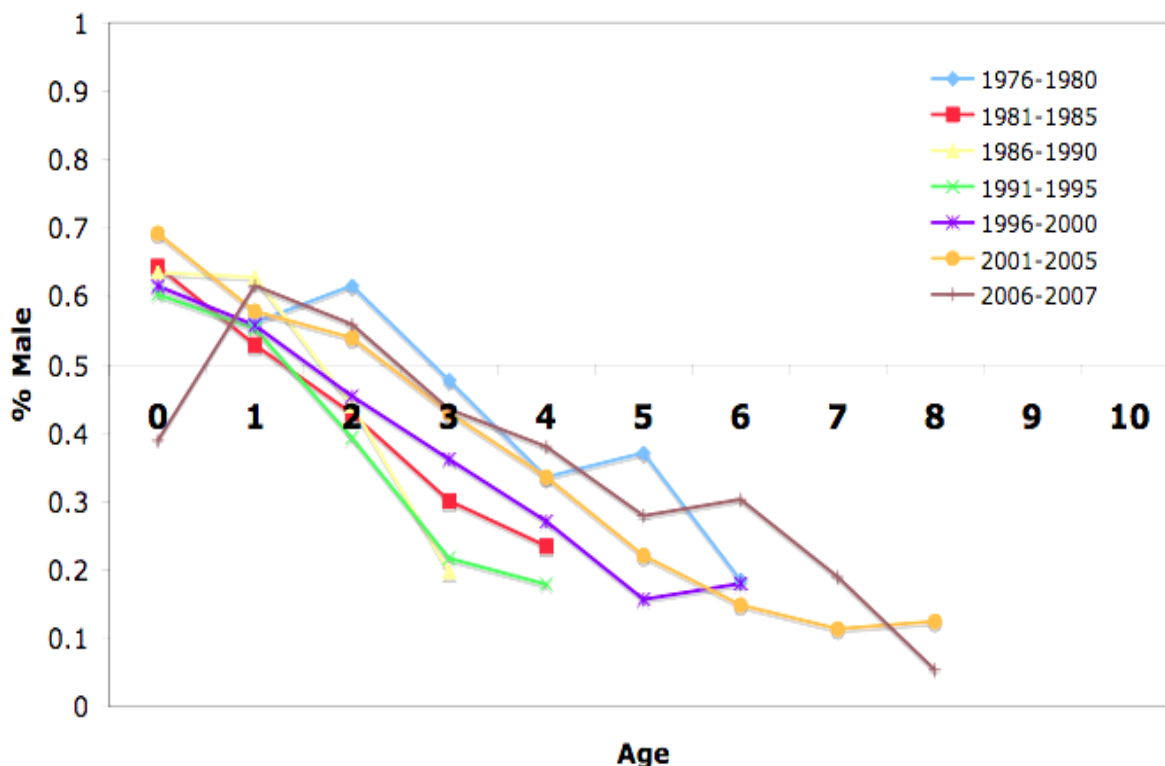
occurs in 17 of 26 years. The average number of age-0 fish sexed per year is 51.5. Given this average, a 50:50 male:female ratio by chance when measured would return a ratio of 60:40 or greater 7.56% of the time. The occurrence rate observed, 17 in 26, would not be expected to occur by chance (binomial test,  $P < 0.0001$ ). Thus, young-of-the-year summer flounder are consistently over-represented by male fish.

**Table 1.** The fraction of summer flounder that are male at age for ages and years where the total number of summer flounder sexed was  $\geq 20$ .

<u>Year</u>	<u>Age 0</u>	<u>Age 1</u>	<u>Age 2</u>	<u>Age 3</u>	<u>Age 4</u>	<u>Age 5</u>	<u>Age 6</u>	<u>Age 7</u>	<u>Age 8</u>
1982	0.707	0.519	0.369	0.133					
1983	0.583	0.466	0.361	0.296					
1984	0.576	0.589	0.304	0.250					
1985	0.674	0.484	0.378	0.263					
1986	0.645	0.590	0.500	0.056					
1987	0.714	0.622	0.474						
1988	0.714	0.783	0.357						
1989	0.574	0.586	0.227						
1990	0.662	0.548							
1991	0.739	0.617	0.476						
1992	0.614	0.534	0.291	0.200					
1993	0.750	0.578	0.348	0.103					
1994	0.436	0.580	0.412	0.135					
1995	0.622	0.451	0.401	0.115					
1996	0.579	0.528	0.302	0.250					
1997	0.667	0.563	0.440	0.281	0.167				
1998	0.574	0.602	0.477	0.303	0.102	0.083			
1999	0.720	0.524	0.502	0.396	0.171	0.045			
2000	0.543	0.571	0.485	0.381	0.297	0.123	0.083		
2001	0.682	0.484	0.529	0.350	0.291	0.171	0.194		
2002	0.737	0.523	0.492	0.474	0.284	0.128	0.069		
2003	0.633	0.644	0.569	0.422	0.331	0.190	0.040	0.062	
2004	0.655	0.582	0.562	0.440	0.260	0.193	0.103	0.059	
2005	0.808	0.635	0.638	0.454	0.397	0.341	0.190		
2006	0.429	0.683	0.515	0.426	0.305	0.197	0.108	0.125	0.062
2007	0.286	0.581	0.666	0.441	0.250	0.196	0.250	0.067	

The second observation is a consistent change in sex ratio with age (Figure 1), such that male frequencies over 0.5 occur only 8 times in 25 cases in age-2 fish and ratios above 0.3 occur only 6 times in age-4 fish. In fact, of the sex ratios accumulated by year-group in Table 2, only one age and year-group pair was characterized by a sex ratio not significantly different from 50:50 male-to-female. Thus, summer flounder are consistently characterized by biased sex ratios regardless of age or half-decadal period within the time series and the direction of bias changes with age.

### Percentage Male at Age



**Figure 1.** The percentage of the stock that is male by age, summarized by year-group.

Two additional observations are worthy of note. First, the three years where females predominate in age-0 fish include the last two years. This is unexpected from the time series record. However, the sex ratio for age-1 fish from the 2006 cohort conforms with typical age-1 sex ratios in being biased in favor of males. Thus, the aberrant 2006 young-of-the-year ratio is likely a sampling artifact. Second, the fraction of fish that are male at older age has increased over time, although remaining well below 0.5. This is particularly apparent for age-3 fish (Table 2). One explanation is that male fish are moderately more susceptible to the fishery at high fishing mortality rates, but two other explanations should first be considered. The same outcome would be obtained either if a reduction in natural mortality rate had occurred or if the originating sex ratio was biased to a greater degree in favor of males. Evidence in Table 1 does not strongly support the latter alternative. Evidence in a subsequent section does not support the penultimate option. The dispersion of males and females as the cohort ages, discussed in a subsequent section, might be interpreted to support the first alternative.

**Table 2.** The fraction of summer flounder that are male at age for ages and year groups where the total number of summer flounder sexed was  $\geq 20$ . Parentheses indicate ratios not significantly different from an expected 50:50 split (binomial test,  $\alpha = 0.05$ ).

<u>Year Group</u>	<u>Age 0</u>	<u>Age 1</u>	<u>Age 2</u>	<u>Age 3</u>	<u>Age 4</u>	<u>Age 5</u>	<u>Age 6</u>	<u>Age 7</u>	<u>Age 8</u>
1982-1985	0.644	(0.518)	0.357	0.222	0.167				
1986-1990	0.641	0.630	0.397	0.140					
1991-1995	0.601	0.543	0.370	0.133	0.074				
1996-2000	0.605	0.544	0.438	0.344	0.227	0.126	0.100		
2001-2005	0.690	0.568	0.550	0.423	0.302	0.192	0.117	0.071	0.158
2006-2007	0.386	0.621	0.588	0.436	0.277	0.197	0.164	0.097	0.042

### Interpretation: Age-dependent Bias in Sex Ratio

A number of potential reasons exist for the male-dominated sex ratios seen in young-of-the-year summer flounder.

Females mature later than males. The observed females may under-represent the total number. The biological database records undifferentiated fish. Assigning all of these fish to the female sex, however, does not markedly change the data summarized in Table 2. Thus, maturity schedule cannot explain the male-dominated sex ratios observed for age-0 fish.

Young males may be more available to the survey. While this possibility cannot be excluded, the fact that females grow faster than males and that the male-biased sex ratios clearly are retained into age 2, albeit at diminishing intensity, suggest that availability is not an adequate explanation.

Protandry would produce the observed age-dependent sequence of sex ratios. Protandry, however, is not reported in flatfish, and would almost assuredly have been observed, were it to exist.

Biased sex ratios have been observed by others in summer flounder, however. Morse (1981) and Smith and Daiber (1977) found that younger, smaller fish were much more likely to be male and that this trend quickly reversed with increasing age. Morse (1981) offers that an initially male-dominated sex ratio is necessary to offset an apparently higher natural mortality rate in males, thus promoting a more nearly 1:1 sex ratio in the spawning stock.

The most viable explanation for biased sex ratios in young-of-the-year summer flounder is temperature-dependent sex determination. Temperature has been shown to influence sex ratios at the point of sexual differentiation in flatfish, not afterwards, and this influence of temperature seems to be a frequent characteristic of flounder species. For example, when barfin flounder, *Verasper moseri*, were reared at high temperatures (18°C for this species), all fish developed as males, whereas at 14°C, the sex ratio was close to 1:1 (Goto et al. 1999). Marbled sole, *Limanda yokohamae*, also show temperature-dependent sex determination; when the larvae were kept in 25°C water, the sex ratio was again strongly skewed towards males (Goto et al. 2000). Southern flounder, *Paralichthys lethostigma*, likewise develop a sex ratio skewed towards males when raised at higher (28°C) or lower (18°C) than optimal temperature, 23°C, which produces a 1:1 ratio (Luckenbach et al. 2003). Although little is known of the genetic determinants of sex, *Paralichthys olivaceus* uses an XX female/XY male system of genetic sex determination, yet high water temperatures (25-27.5°C) produce physiological males possessing an XX genotype.

Genetically determined males (*XY*) were never observed to develop into physiological females (Yamamoto 1999).

Among the flatfishes have been shown to exhibit temperature-dependent sex determination are two species of the same genus as summer flounder, the Japanese flounder or hirame, *Paralichthys olivaceus*, and the southern flounder, *Paralichthys lethostigma* (Yamamoto 1999; Luckenbach, et al.2003). Furthermore, in both cases, extreme temperatures result in a higher fraction of the young being male. This could potentially explain why a higher fraction of young-of-the-year summer flounder are found at the northern and southern edges of their range, as described subsequently.

## Sex Ratio as a Function of Region and Depth

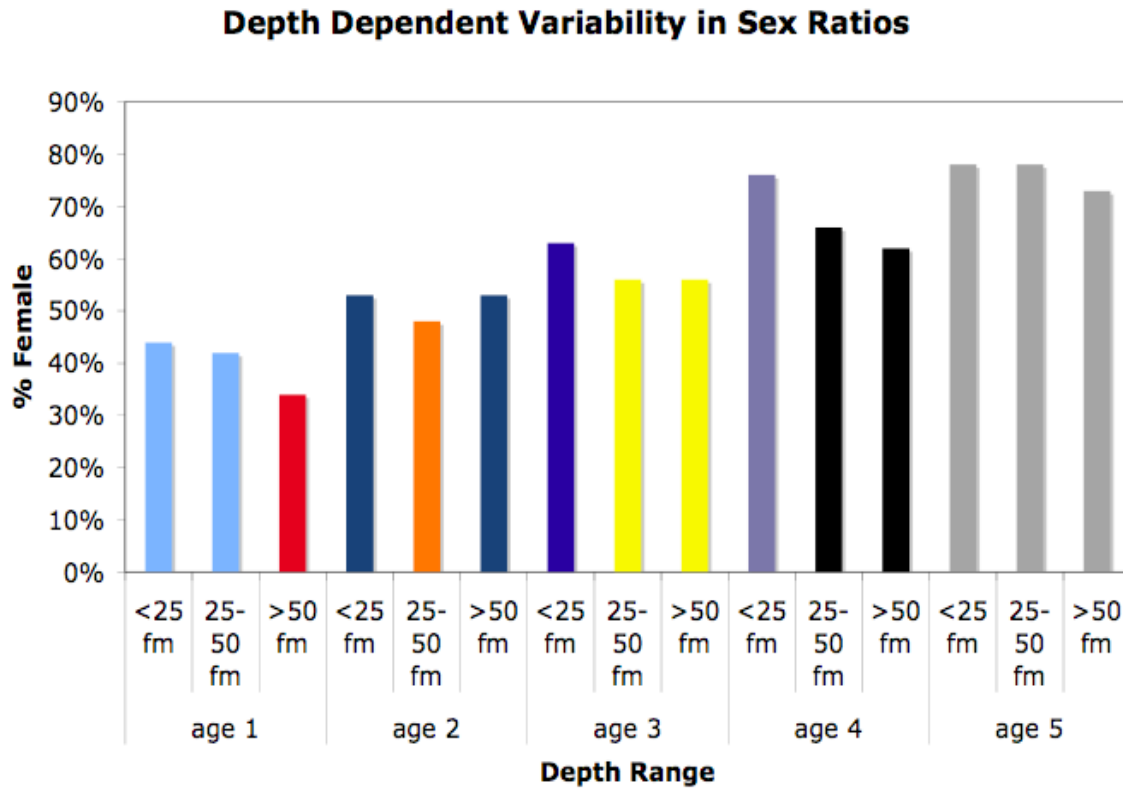
### Methods and Results

For this analysis, we allocated strata to three depth zones (<25 fm; 25-50 fm; >50 fm). This division allocated sex-ratio data into approximately equivalent groups by data richness. Insufficient data were present to achieve a finer division of deeper-water strata. Strata were allocated to five regions: southern New England (we included Georges Bank strata in this grouping), the northern Mid-Atlantic Bight, Delmarva, and the strata south of Cape Hatteras. Finally, data were allocated to half-decadal year-groups: 1976-1980, 1981-1985, 1986-1990, 1991-1995, 1996-2000, 2001-2005, 2006-2007. We excluded all occurrences of age-year group, age-region, and age-depth combinations with sex ratios supported by a total count of males and females less than 30. ANOVAs were run by age using depth, year-group, and region as main effects. All interaction terms were included. Sex was implemented as a dependent variable by assigning a 0 to males and a 1 to females. Means, accordingly, were equivalent to the fraction female.

**Table 3.** Results of ANOVAs examining the impact of depth, region, and year-group on sex ratios at age. Blank cells indicate insufficient data. NS, non-significant at  $\alpha = 0.05$ . ×, an interaction term.

Age	Region	Depth	Year Group	Depth × Region	Depth × Year Group	Year Group × Region	Year Group × Depth × Region
0	NS		≤.001			NS	
1	NS	NS	NS	≤.001	NS	NS	0.01
2	0.05	≤.001	≤.001	≤.001	NS	≤.001	0.005
3	NS	0.002	≤.001	NS	NS	NS	0.005
4	≤.001	NS	0.01	NS	0.03	NS	NS
5	≤.001	NS	0.006	NS	NS	NS	NS
6	NS	NS	NS	NS	NS	NS	NS
7	NS	NS	NS	NS	NS	NS	NS

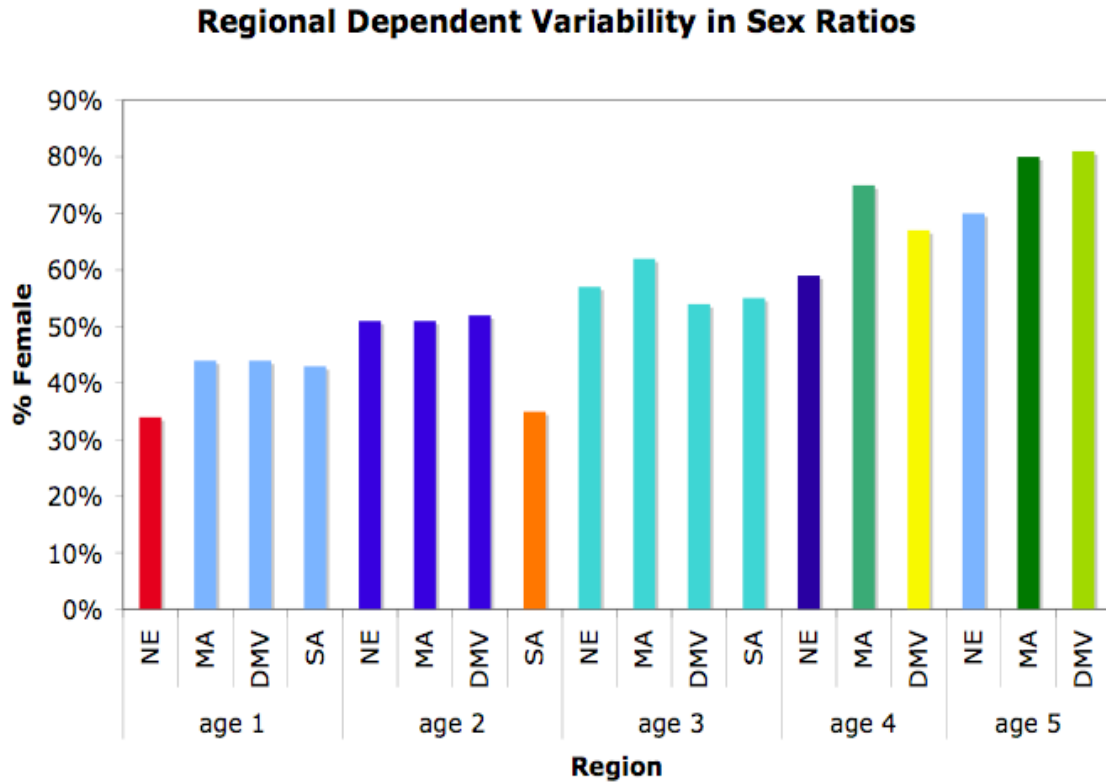
Depth significantly influenced sex ratio in summer flounder, ages 2 and 3 (Table 3). The catch of age-0 fish was insufficient in the deeper depth zones to analyze. Whereas depth was only significant for ages 2 and 3 in the ANOVA, Tukey's studentized range tests identified depth differences in sex ratios for ages 1 through 4. The presence of significant interaction terms, however, limits the interpretation of this *a posteriori* test. For these younger fish, exclusive of age 1, a tendency exists for the sex ratios to be more nearly 50:50 offshore (Figure 2). Age-1 males are distinctly proportionately more common offshore. At ages 5 and older, depth no longer impacts sex ratios significantly in summer flounder.



**Figure 2.** Mean percent female at age by depth. Bars within an age group with the same color were not significantly different in an *a posteriori* Tukey's test. ANOVA results are in Table 3

Sex ratios were significantly affected by region at age 2, but much more so for ages 4 and 5 (Table 3). The switch between depth and region as the dominant main effect between ages 3 and 4 is dramatic and suggests a differential segregation of the stock spatially as the fish age. Interaction terms were routinely significant between main effects for younger ages, but rarely significant after age 3. The change in significant main effect with age and the frequency of significant interaction terms including depth suggests that regionality in summer flounder sex ratios is not facily explained simply in terms of depth and latitude. Tukey's studentized range tests document the tendency for the northern Mid-Atlantic and Delmarva regions to group together, while one of either the south Atlantic or southern New England regions differed significantly from the central region group (Figure 3). For the cases in which region was a significant main effect, a significantly lower fraction of females occurred in southern New England strata when compared to the Delmarva and northern Mid-Atlantic regions.

Year-group was highly significant for ages 0, 2, 3, 4, and 5. Tukey's studentized range tests clearly indicated a pattern for early years (1976-1980) and later years (2001-2007) to group together and for middle years (1981-1996) to group together (Figure 4). These groupings can be correlated with periods of low and high abundance. Furthermore, periods of lower abundance routinely had higher male ratios than periods of high abundance.

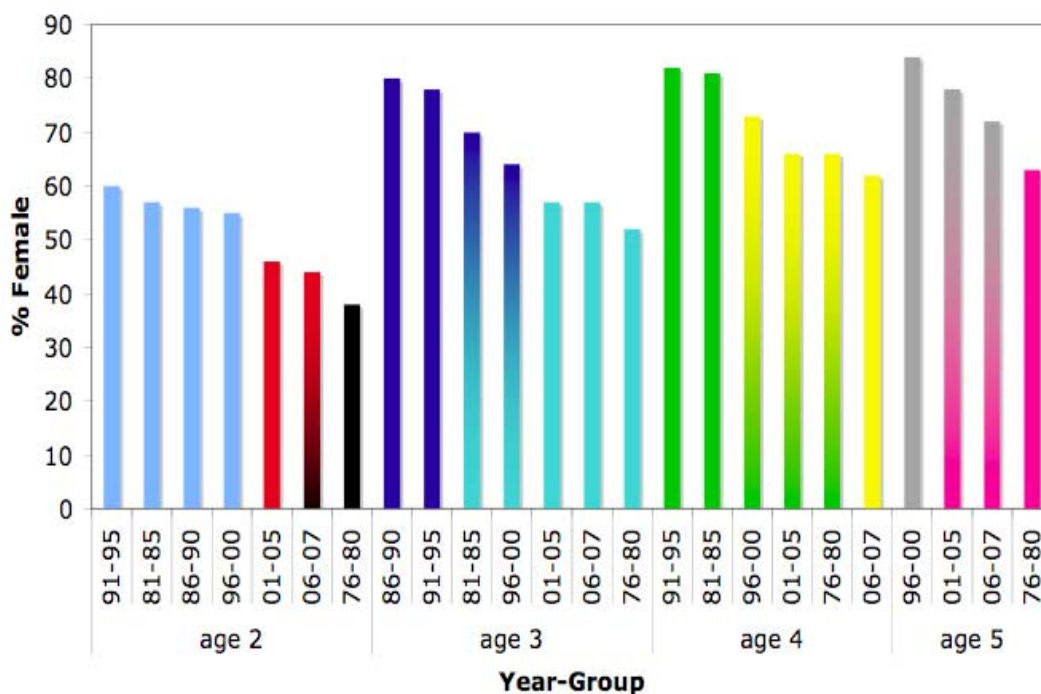


**Figure 3.** Mean percent female at age by region. Bars within an age group with the same color were not significantly different in an *a posteriori* Tukey's test. ANOVA results are in Table 3. NE, southern New England; MA, northern Mid-Atlantic; DMV, Delmarva; SA, south Atlantic.

**Interpretation: Spatial Divergence in Sex Ratio**

Examining the regional results for overall trends, it seems that the northern Mid-Atlantic and Delmarva regions have similar sex ratios regardless of age. In addition, the south Atlantic and southern New England regions have a tendency to be different from the Mid-Atlantic/Delmarva grouping, depending on age. When different, the southern New England and south Atlantic regions routinely have a higher fraction of males. This is precisely what would be expected from the temperature-dependent determination of sex that produces an increase in fraction male at the temperature extremes; however, sex determination in the first year of life militates against this explanation as the main effect of region is observed only later. Thus, alternative biological explanations or determinants from differential fishing mortality must be sought. The depth and year-group effects are, as yet, unexplained.

### Age-Group Dependent Variability in Sex Ratios



**Figure 4.** Mean percent female at age by year-group. Bars within an age group with the same color were not significantly different in an *a posteriori* Tukey's test. ANOVA results are in Table 3.

### Sex Ratio-imposed Requirement on Relative Mortality Rate

#### Methods and Results

The gradual shift in sex ratio from male-dominated to female-dominated with increasing age might accrue from differential mortality or differential availability. The latter would seem unlikely, as the trends in sex ratio are consistent across a wide range of age groups.

The differential rate of natural mortality can be directly calculated from the information provided in Table 2. The calculation is based on the following governing equation:

$$N_{1_m} + N_{1_f} = N_{0_m} e^{-Z_m t} + N_{0_f} e^{-Z_f t} \quad (1)$$

where  $N$  is abundance of males  $m$  or females  $f$ ,  $Z$  is total mortality rate,  $t$  is time, and numerals designate consecutive time periods. The equation can be converted to ratio form by dividing through by  $N_1$ :

$$1 = \frac{N_{0_m}}{N_1} e^{-Z_m t} + \frac{N_{0_f}}{N_1} e^{-Z_f t} \quad (2)$$

Equation (2) can be solved iteratively under the conditions that the sum of the two terms on the right-hand side closely approximate 1, that  $N_{1_m} \leq N_{0_m}$ , and that  $N_{1_f} \leq N_{0_f}$ .



**Table 4.** Relative natural mortality rates of male and female summer flounder calculated from the changes in sex ratios with age, by year-group, Delmarva and northern Mid-Atlantic region only, from equation (2).

Year Group	Male ( $Z_m$ )	Female ( $Z_f$ )
1976-1980	0.46	0.12
1981-1985	0.82	0.42
1986-1990	0.51	0.13
1991-1995	0.53	0.30
1996-2000	0.25	0.22
2001-2005	0.53	0.22
All years	0.62	0.22

Table 4 demonstrates that the change in sex ratio over the lifespan of a cohort requires a differential natural mortality rate, whereby males die at a much faster rate than females. The calculation is robust in measuring the relative mortality rate. The mortality rate for males is often twice that of females. Considering the entire dataset, all years combined, the natural mortality rate for males is about three times the female rate (Table 4). The calculation is less robust in measuring absolute natural mortality rate as any mortality process distributed evenly among the sexes would not impact an estimate based on varying sex ratios. Nevertheless, the female natural mortality rate of 0.22 for all years is remarkably similar to the assumed female natural mortality rate derived from estimates of female lifespan.

### Interpretation: Sex-specific Natural Mortality Rate

The change in sex ratio with age requires that male and female summer flounder be modeled separately as far as natural mortality rate. In lieu of a sex-explicit model, a whole stock mortality rate might be employed, although this is less satisfactory. The natural mortality rate, derived thusly, is not linear, however (Table 5). We calculated this age-dependent rate using the equation:

$$Z_{m+f} = -\log\left(\frac{N_{0_m} e^{-Z_m t} + N_{0_f} e^{-Z_f t}}{N_{0_{m+f}}}\right) \quad (3)$$

Equation (3) was employed using age-independent mortality rates for males and females from Table 4, based on the observation of relatively constant mortality with age within sex inferred from Figure 5. Whole-stock natural mortality rates derived thusly vary from 0.45 for young-of-the-year summer flounder to 0.25 for fish age 7 and older (Table 5).

**Table 5.** Whole-stock mortality rate based on the age-dependency in sex ratio from 1976-2007 and the male and female natural mortality rates reported in Table 4.

<u>Age 0</u>	<u>Age 1</u>	<u>Age 2</u>	<u>Age 3</u>	<u>Age 4</u>	<u>Age 5</u>	<u>Age 6</u>	<u>Age 7</u>
0.447	0.424	0.394	0.362	0.316	0.286	0.262	0.245

A higher natural mortality rate in males could potentially be explained by some type of biological refuge for females. Female summer flounder are known to grow at a faster rate than males and may therefore be less prone to predation (Poole 1961). However, male and female growth rates are similar until age 2, so such an explanation would not be warranted when considering the apparent differential natural mortality in fish younger than age 2.

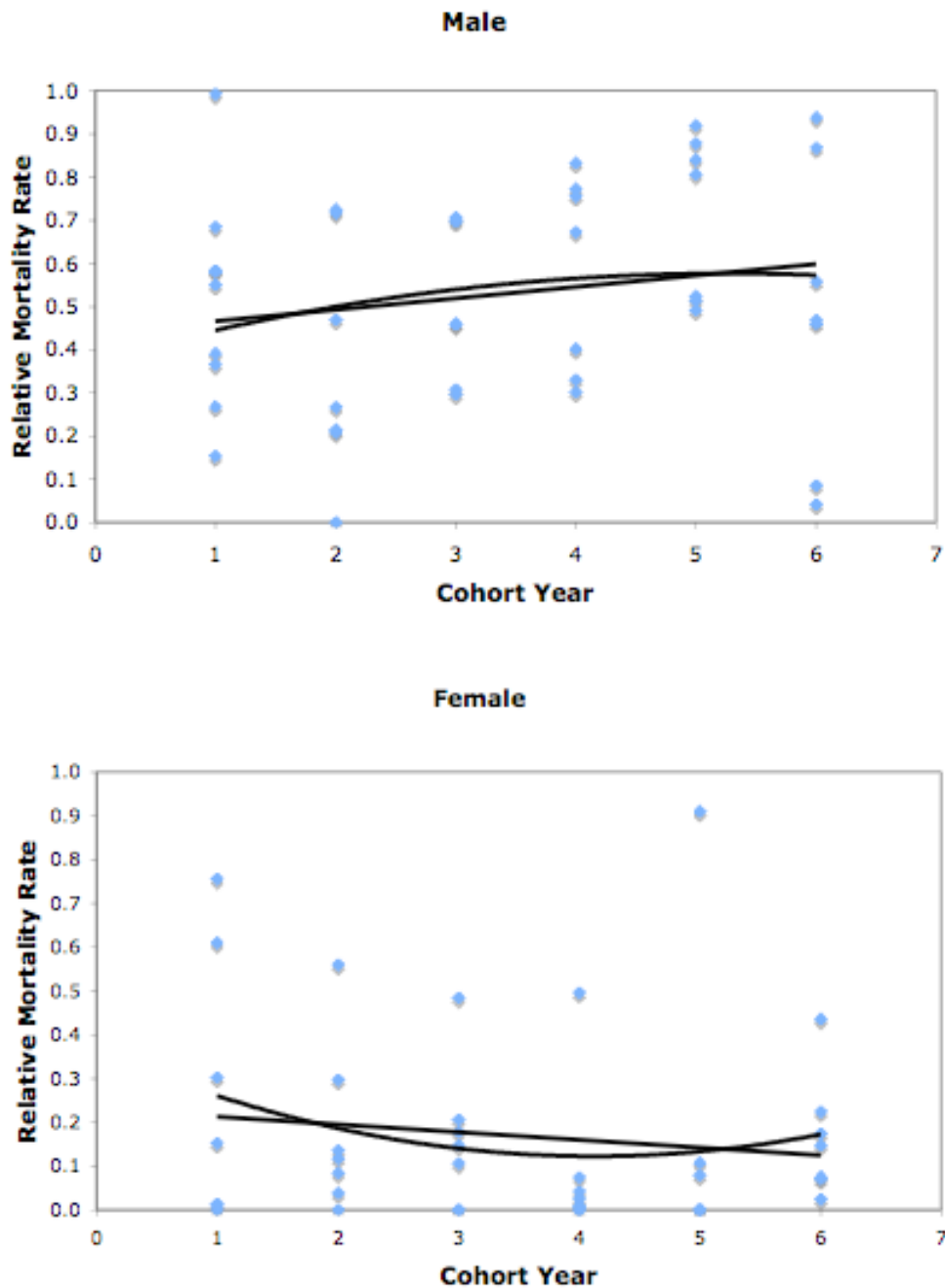
Some precedent exists for higher mortality rates in male relative to female flatfish. Morse (1981) already proposed a higher natural mortality rate for males in summer flounder. Santos (1994) computed natural mortality rates for the four-spot megrim (*Lepidorhombus boscii*) by sex. The natural mortality rate for males was 0.41, and for females 0.34. Pearson and McNally (2005) also calculated mortality rates, using three different methods, for the sand sole, *Psettyichthys melanostictus*. The natural mortality rate for females ranged between 0.35 and 0.45, whereas the mortality rate for males was estimated to fall between 0.40 to 0.60.

## **Comparison of Age-Length Keys: Relationship of Length at Age with Region and Depth**

### **Methods and Results**

Tables 6 and 7 show the results of ANOVAs examining the relationship of depth, region, and year-group on length at age. For these analyses, the dependent variable, length, was ranked. Thus, the analysis is nonparametric. Depth significantly impacted length-at-age for males and females, ages 1 through 3 and age 4 for females. At age 0, summer flounder are only present in shallow waters, and at age 5 and older, depth no longer influences length-at-age, for the most part. Tukey's studentized range tests show that fish in deeper water are larger at a given age than fish in shallower water (Figure 6).

Length at age varied significantly with region for male and female summer flounder, ages 0-4, but not at older ages. Whereas Tukey's Studentized Range tests identified a tendency for some regions to group together at some ages, overall, fish are smaller in the south and get progressively larger at all ages, 0-4, northward (Figure 7). When regions did group together they did so in a north-central, south-central trend. In other words, the southern New England region never grouped with the south Atlantic or Delmarva regions, and the south Atlantic never grouped with the northern Mid-Atlantic and southern New England regions.



**Figure 5.** Trends in natural mortality rate by age for male and female summer flounder. Points are values from each of the years from 1976-2006 where sufficient data density permitted the estimate of within-cohort natural mortality rate at age. Neither polynomial nor linear curve fits transit a slope significantly at variance to zero.

## Comparison of Age-Length Keys: Relationship of Length at Age with Region and Depth

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Disregarding the influence of fishing mortality on age-at-length, these trends indicate that summer flounder either grow at faster rates in deeper water and northern latitudes or that larger fish at age preferentially aggregate in these regions. Alternatively, in shallow waters and at southern latitudes larger fish may be more accessible to the fishery. While the fishery may not keep younger fish due to minimum size restrictions, younger fish may still be removed by the fishery as discard mortality. Whether it be a biological reason (e.g., differential growth rates) or a fishery-related reason (bigger fish at any age are more accessible in shallow/southern water), it seems clear that the average size of fish at age is larger in deeper/northern water than in shallow/southern water.

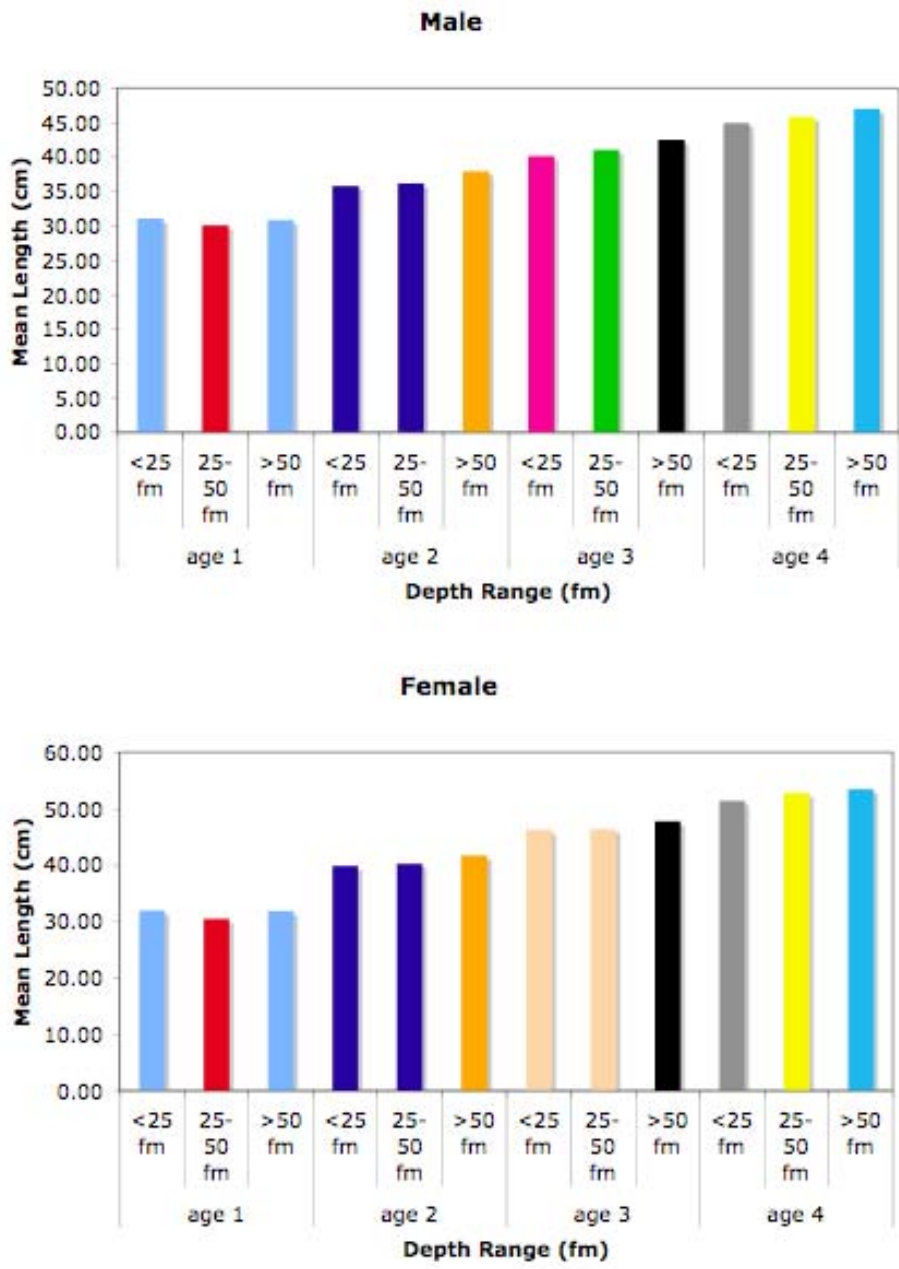
However, significant interaction terms also occur commonly in fish 4 years or less in age and these involve both depth and region with relatively equal frequency and intensity. The frequency of significant interaction terms including depth and region suggests that regionality in the trends in age at length for summer flounder cannot facily be explained simply in terms of depth and latitude. A more complex mixture of biology and, perhaps, relative fishing impact is likely to be required. These trends are remarkably reminiscent of those observed earlier for sex ratio (Table 3).

**Table 6.** Results of ANOVAs examining the impact of depth, region, and year-group on male length for summer flounder. All regional data were included. Blank cells indicate insufficient data. NS, non-significant at  $\alpha = 0.05$ .  $\times$ , an interaction term.

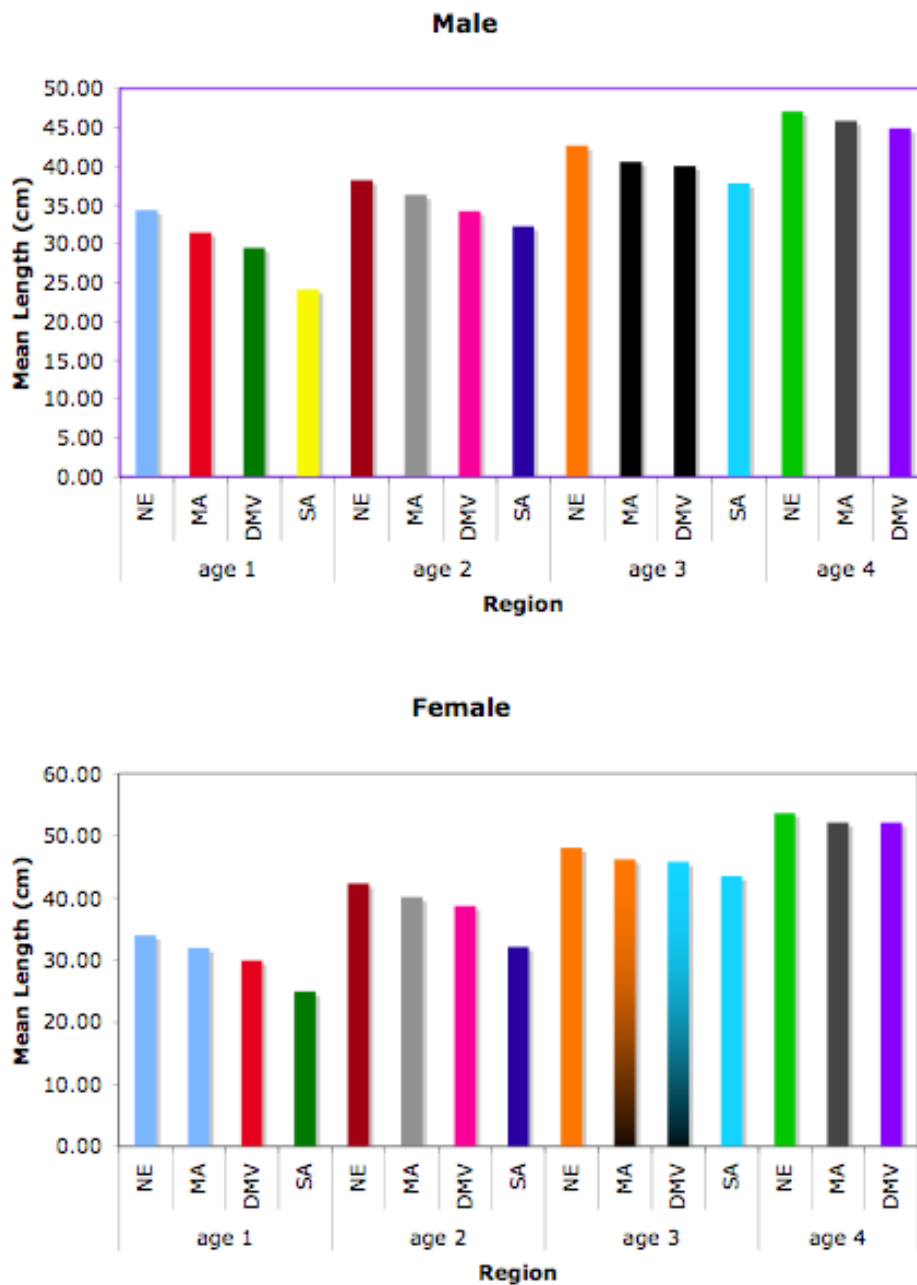
Age	Region	Depth	Year Group	Depth $\times$ Region	Depth $\times$ Year Group	Year Group $\times$ Region	Year Group $\times$ Depth $\times$ Region
0	$\leq 0.001$		$\leq 0.001$			NS	
1	$\leq 0.001$	$\leq 0.001$	$\leq 0.001$	$\leq 0.001$	0.006	$\leq 0.001$	NS
2	$\leq 0.001$	$\leq 0.001$	$\leq 0.001$	NS	$\leq 0.001$	$\leq 0.001$	
3	$\leq 0.001$	$\leq 0.001$	$\leq 0.001$	$\leq 0.001$	NS	NS	NS
4	0.02	NS	$\leq 0.001$	$\leq 0.001$	NS	NS	NS
5	NS	NS	$\leq 0.001$	NS	NS	NS	NS
6	NS	NS	NS	NS	NS	NS	NS
7	NS	NS	NS	NS	NS	NS	

**Table 7.** Results of ANOVAs examining the impact of depth, region, and year-group on female length for summer flounder. All regional data were included. Blank cells indicate insufficient data. NS, non-significant at  $\alpha = 0.05$ .  $\times$ , an interaction term.

Age	Region	Depth	Year Group	Depth $\times$ Region	Depth $\times$ Year Group	Year Group $\times$ Region	Year Group $\times$ Depth $\times$ Region
0	$\leq 0.001$		$\leq 0.001$			NS	
1	$\leq 0.001$	$\leq 0.001$	$\leq 0.001$	$\leq 0.001$	NS	$\leq 0.001$	0.003
2	$\leq 0.001$	$\leq 0.001$	$\leq 0.001$	$\leq 0.001$	$\leq 0.001$	0.02	NS
3	$\leq 0.001$	$\leq 0.001$	$\leq 0.001$	$\leq 0.001$	0.03	0.02	NS
4	$\leq 0.001$	0.008	$\leq 0.001$	NS	$\leq 0.001$	NS	0.02
5	NS	NS	$\leq 0.001$	NS	NS	NS	NS
6	NS	0.01	$\leq 0.001$	NS	NS	NS	NS
7	NS	NS	0.006	NS	NS	NS	



**Figure 6.** Mean length at age for male and female summer flounder. Bars within an age group with the same color were not significantly different in an *a posteriori* Tukey's test. ANOVA results are in Tables 6 and 7.



**Figure 7.** Mean length at age for male and female summer flounder. Bars within an age group with the same color were not significantly different in an *a posteriori* Tukey's test. ANOVA results are in Tables 6 and 7. NE, southern New England; MA, northern Mid-Atlantic; DMV, Delmarva; SA, south Atlantic

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Disregarding the influence of fishing mortality on age-at-length, these trends indicate that summer flounder either grow at faster rates in deeper water and northern latitudes or that larger fish at age preferentially aggregate in these regions. Alternatively, in shallow waters and at southern latitudes larger fish may be more accessible to the fishery. While the fishery may not keep younger fish due to minimum size restrictions, younger fish may still be removed by the fishery as discard mortality. Whether it be a biological reason (e.g., differential growth rates) or a fishery-related reason (bigger fish at any age are more accessible in shallow/southern water), it seems clear that the average size of fish at age is larger in deeper/northern water than in shallow/southern water.

However, significant interaction terms also occur commonly in fish 4 years or less in age and these involve both depth and region with relatively equal frequency and intensity. The frequency of significant interaction terms including depth and region suggests that regionality in the trends in age at length for summer flounder cannot facily be explained simply in terms of depth and latitude. A more complex mixture of biology and, perhaps, relative fishing impact is likely to be required. These trends are remarkably reminiscent of those observed earlier for sex ratio (Table 3).

Year-group consistently affected length at age for male and female summer flounder until age 6. Year-group no longer impacted length at age for male summer flounder at age 6 and older, but continued to do so for female fish. A few trends are clear in both males and females. First, summer flounder averaged much smaller at all ages in the period from 1976-1980 than any other year group. Additionally, year groups including years 1981-1985 and 2006-2007, generally group together as periods where size was smaller at age. Other year-groups are not consistently associated with small or large size-at-age groups. The former groupings are interesting because these periods are associated with relatively high abundance in comparison to the intermediate years. Additionally, a similar trend was noted in the sex ratio analyses.

Tables 8 and 9 repeat the ANOVAs of Tables 6 and 7, but restrict regional coverage to the two central regions, Delmarva and northern Mid-Atlantic. The frequency of significant main effects is much reduced in these ANOVAs relative to the earlier ones, although depth effects in particular continue to be present. Even for depth, significant main effects are less common, as are significant interaction terms, indicating that the central component of the stock offers a more spatially coherent picture than those portions near the northern and southern range limits.



**Table 8.** Results of ANOVAs examining the impact of depth, region, and year-group on male summer flounder length. Only the Mid-Atlantic and Delmarva regions were included. Blank cells indicate insufficient data. NS, non-significant at  $\alpha = 0.05$ .  $\times$ , an interaction term.

Age	Region	Depth	Year Group	Depth $\times$ Region	Depth $\times$ Year Group	Year Group $\times$ Region	Year Group $\times$ Depth $\times$ Region
0	$\leq.001$		$\leq.001$			NS	
1	NS	$\leq.001$	$\leq.001$	$\leq.001$	$\leq.001$	NS	NS
2	NS	$\leq.001$	$\leq.001$	NS	$\leq.001$	NS	NS
3	NS	NS	$\leq.001$	0.04	NS	NS	NS
4	NS	NS	$\leq.001$	NS	NS	NS	NS
5	NS	NS	0.002	NS	NS	NS	NS
6	NS	NS	NS	NS	NS	NS	
7	NS	NS	NS				

#### Interpretation: Spatial Variation in Length-at-age

The ANOVAS of Tables 6-9 suggest that a single age-length key is not likely to be representative across all regions and in different depths. Furthermore, the differential with region and depth suggests that differential fishing pressure cannot be excluded as the mechanism generating these differences.

**Table 9.** Results of ANOVAs examining the impact of depth, region, and year-group on female summer flounder length. Only the Mid-Atlantic and Delmarva regions were included. Blank cells indicate insufficient data. NS, non-significant at  $\alpha = 0.05$ .  $\times$ , an interaction term.

Age	Region	Depth	Year Group	Depth $\times$ Region	Depth $\times$ Year Group	Year Group $\times$ Region	Year Group $\times$ Depth $\times$ Region
0	$\leq.001$		$\leq.001$			NS	
1	NS	$\leq.001$	$\leq.001$	$\leq.001$	NS	0.005	$\leq.001$
2	NS	$\leq.001$	$\leq.001$	NS	$\leq.001$	NS	NS
3	NS	$\leq.001$	$\leq.001$	NS	0.01	NS	NS
4	NS	NS	$\leq.001$	NS	0.004	NS	NS
5	NS	NS	$\leq.001$	NS	NS	NS	NS
6	NS	NS	$\leq.001$	NS	NS	NS	NS
7	NS	NS	0.04	NS	NS	NS	NS

## Comparison of Age-Length Keys: Comparison of Key Structure Across Region and Depth

### Methods and Results

These analyses focused on the age-length keys for the Delmarva and northern Mid-Atlantic region and, independently, on the three depth zones previously described, as these two regions were most similar in length at age. To compare keys efficiently, lengths were combined into 12 units, the central 10 being 5 cm intervals. Size 12 included fish  $\geq 70$  cm and size 1 included fish  $< 20$  cm. This yielded three age-length keys for the three depth zones and two for the two regions. Each of these returned a significant result from a by-region or by-depth chi-square test, and from a Cochran-Mantel-Haenszel test controlling for depth or region. Tests were conducted on doubly standardized arrays (columns and rows). These results are anticipated since the ages are not independently distributed with respect to lengths in these keys.

The commonest age at length translates a diagonal from the northwestern to the southeastern corner of the age-length array (age in columns, length in rows). This trend is consistent across keys. A same cell-to-same cell mapping evaluated by a Spearman's rank correlation test on doubly standardized arrays returned a significance level of  $P < 0.0005$  or better for each pair-wise comparison (e.g., Delmarva vs northern Mid-Atlantic). This also is expected from the anticipated structure of the keys.

These two standard statistics are described because these approaches, plus the afore-described ANOVAs (Tables 6-9) represent typical statistical treatments of age-length data. None of them answer the query concerning equivalency of the age-length relationship documented by the distribution of ages at length in the two-dimensional array of the key.

To directly compare two keys, we used Geary's C and Moran's I statistics on the set of residuals obtained by calculating the expected key structure in one array from the observed key structure in the other. Each row was standardized, but a column standardization was not performed. Residuals were calculated for each array cell as  $expected_{i,j} - observed_{i,j}$  where the expected values were obtained from the first of two paired arrays. The null hypothesis is that the residuals will be randomly distributed in x-y space. A statistical test revealing a non-random pattern in the residuals indicates that some portion of the two arrays under examination differ in the distribution of values among cells; that is, that the age-length relationship differs.

The test statistics were calculated following Cliff and Ord (1973) where:

$$Moran's\ I = \left( \frac{n}{W} \right) \frac{\sum_{i=1}^n \sum_{j=1}^n \substack{i \neq j \\ w_{ij} z_i z_j}}{\sum_{i=1}^n z_i^2} ; \quad (4)$$

$$Geary's\ C = \left( \frac{n-1}{2W} \right) \frac{\sum_{i=1}^n \sum_{j=1}^n \substack{i \neq j \\ w_{ij} (x_i - x_j)^2}}{\sum_{i=1}^n z_i^2} \quad (5)$$

and

$$W = \sum_{i=1}^n \sum_{j=1}^n \substack{i \neq j \\ w_{ij}} ; \quad (6)$$

$$z_i = x_i - \bar{x}; \tag{7}$$

$n$  = number of samples;  $x_i$  = datum of each sample  $i$ ; and  $w_{ij}$  = a weighting measure as described subsequently. Significance levels were calculated under the assumption of randomization (Jumars et al., 1977).

Calculation of Moran's I or Geary's C is contingent on the mathematical representation of the spatial relationship of the cell values ( $w_{ij}$ ). We employed a King's moves weighting such that any two cells  $i$  and  $j$  located in the array at position  $k,l$  for  $i$  and at positions  $k,l+1, k,l-1, k-1, l$ , and  $k+1, l$  for  $j$  were given  $w_{ij} = 1.0$ . For the remainder,  $w_{ij} = 0$ .

Moran's I is sensitive to the location of extreme departures from the mean ( $x_i - \bar{x}$ ). The expected value of I for spatially randomly distributed samples is  $-(n-1)^{-1}$ , a number close to zero at high  $n$  (Cliff and Ord, 1973). High values of I occur if  $x_i$  and  $x_j$  are both, much above or much below the mean. Geary's C is sensitive to sample-to-sample variation ( $x_i - x_j$ ). Values above 1.0 indicate negative spatial autocorrelation (i.e., neighboring values less similar than expected by chance), an even distribution. Values below 1.0 indicate positive spatial autocorrelation (i.e., neighboring values more similar than expected by chance), a patchy distribution.

Both statistics are provided; however the question at hand is the relationship of nearest neighbors in the array and thus a strong preference is given to Geary's C as the statistic best evaluating similarity between two age-length arrays.

An important question concerns the incorporation of zeros. The northeastern and southwestern corners of the arrays routinely contain zeros. These paired zeros increase the number of cells and thus bias the statistic in proportion to their importance, as they are a guaranteed characteristic of the array if formulated correctly. An additional concern is singleton zeros, as the residual obtained is less constrained than for cases with paired non-zero values. In our opinion, the most valid approach is to discount paired-zeros only. Results of comparison of three age-length keys for the three depths and two geographic regions are provided in Tables 10 and 11. These comparisons are based on the exclusion of paired-zero cells.

**Table 10.** Values of Geary's C and Moran's I and significance for the cases in which array cells characterized by paired zeros were excluded. Age-length keys compared were for males only. The first array in each array pair as listed is the parent array used to generate the expected values for the second array. Residuals were calculated for the second array. Significance values are Moran's I over Geary's C

$\left( \frac{\text{Moran's I}}{\text{Geary's C}} \right)$ . NS, not significant. For region, Delmarva was used as the parent array.

<u>Array Pair</u>	<u>Moran's I</u>	<u>Geary's C</u>	<u>Significance</u>
Depth 1 vs. 2	0.182	2.175	$P < 0.05$ $P < 0.005$
Depth 1 vs. 3	-0.005	2.281	NS $P < 0.005$
Depth 2 vs. 3	0.164	0.932	$P < 0.005$ $P < 0.005$
Region	-0.090	2.353	NS NS $P < 0.005$

**Table 11.** Values of Geary's C and Moran's I and significance for the cases in which array cells characterized by paired zeros were excluded. Age-length keys compared were for females only. The first array in each array pair as listed is the parent array used to generate the expected values for the second array. Residuals were calculated for the second array. Significance values are Moran's I over Geary's C  $\left(\frac{\text{Moran's I}}{\text{Geary's C}}\right)$ .

NS, not significant. For region, Delmarva was used as the parent array.

<u>Array Pair</u>	<u>Moran's I</u>	<u>Geary's C</u>	<u>Significance</u>
Depth 1 vs. 2	0.056	1.645	<u>NS</u>
			<u><math>P &lt; 0.01</math></u>
Depth 1 vs. 3	0.174	1.392	<u><math>P &lt; 0.05</math></u>
			<u><math>P &lt; 0.10</math></u>
Depth 2 vs. 3	0.026	0.890	<u>NS</u>
			<u>NS</u>
Region	-0.013	1.573	<u>NS</u>
			<u><math>P &lt; 0.05</math></u>

The trend with depth is exemplified by Table 12 in which is compared via residuals the arrays for depths 1 (<25 fm) and 3 (>50 fm). A negative residual indicates a higher value in the second array (>50 fm). Consistently, across size groups, the negative residuals occur at older ages indicating that male fish of a given size tend to be older at deeper depths. This is consistent with ANOVA results described earlier in Tables 6-9. Table 13 compares the male arrays for the two regions. In this case, the residual pattern is more complex; however, negative values tend to occur at younger ages for a given size, indicating that males tend to be older at size in the southern portion of the Mid-Atlantic Bight. This is also consistent with ANOVA results.

**Table 12.** Residual pattern for the comparison of and example age-length relationship in summer flounder males between arrays representing depths 1 and 3.

<u>Length (cm)</u>	<u>Age 0</u>	<u>Age 1</u>	<u>Age 2</u>	<u>Age 3</u>	<u>Age 4</u>	<u>Age 5</u>	<u>Age 6</u>
<20	54.43	-60.76	6.33				
20-<25	30.01	-40.91	10.90				
25-<30	23.04	-35.13	12.62	-0.60	0.07		
30-<35	6.92	14.68	-15.40	-5.69	-0.51		
35-<40	0.33	42.35	-31.37	-10.17	-0.69	-0.46	
40-<45		10.06	30.03	-28.95	-9.65	-1.49	
45-<50		1.00	18.93	12.20	-22.38	-7.77	-1.99
50-<55			4.42	18.67	-9.67	-2.05	-11.37
55-<60			1.91	-4.88	3.29	11.77	-12.09

**Table 13.** Residual pattern for the comparison of and example age-length relationship in summer flounder males between arrays representing Delmarva and the northern Mid-Atlantic Bight.

<u>Length (cm)</u>	<u>Age 0</u>	<u>Age 1</u>	<u>Age 2</u>	<u>Age 3</u>	<u>Age 4</u>	<u>Age 5</u>	<u>Age 6</u>
<20	17.5540	-24.7482	7.1942				
20-<25	20.0380	-25.6052	5.5672				
25-<30	9.2232	-16.8604	7.6844	-0.2277	0.1805		
30-<35	0.4179	-2.9349	0.8727	1.4069	0.2375		
35-<40	-0.0198	-14.4489	7.3256	5.8648	1.2466	0.0317	
40-<45		-1.8036	-17.6687	12.4069	7.1451	-0.0799	
45-<50		-0.4988	-8.7182	-3.3502	12.3292	0.4147	-0.1767
50-<55		-1.6949	-2.6635	3.8740	6.7192	-6.2349	
55-<60		-4.0000	16.6667	13.3333	-31.3333	5.3333	

### Interpretation

The male age-length relationships are more variable over depth and region than the female ones. Probably, this accrues from the higher natural mortality rates for the males which are also probably more variable spatially. The analyses suggest that a single age-length key may not be adequate, particularly for the males. However, comparison of model runs using different age-length keys would be needed to determine whether the observed variations are substantive for stock modeling. Regardless, the analyses again focus on the need to differentiate the two sexes and to investigate a spatially explicit model.

### Conclusions and Recommendations

1. Young-of-the-year summer flounder are dominantly male. Sex ratio changes gradually with age such that male frequencies over 0.5 occur infrequently by age 2 and rarely exceed 0.3 by age 4. The biased sex ratio at birth is likely the result of temperature-dependent sex determination (TSD).
2. The age-dependency of sex ratio indicates the need to implement a sex-explicit model for summer flounder. Spatial variation in sex ratio suggests that a single sex-at-age key is not likely to be representative across all regions and in different depths.
3. The change in sex ratio with age also requires that separate natural mortality rates be used for male and female summer flounder stock assessment models. In lieu of a sex-explicit model, a whole stock mortality rate might be employed, although this is less satisfactory. The natural mortality rate, derived thusly, is not linear, but varies from 0.45 for age-0 fish to 0.25 for fish age 7 and older.
4. Higher natural mortality rate in male summer flounder is supported by published information on summer flounder and other flatfish.
5. Spatial variation in length-at-age suggests that a single age-length key is not likely to be representative across all regions and in different depths. The differential with region

and depth suggests that differential fishing pressure cannot be excluded as the mechanism generating these differences.

6. The male age-length relationships are more variable over depth and region than the female ones, but each varies significantly. The analyses suggest that a single age-length key may not adequately describe the stock, particularly for the males.

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## APPENDIX 4

### SAW 47 Working Paper 10 (TOR 4) – Surplus Production Model

#### Re-evaluation of Summer Flounder (*Paralichthys dentatus*) Stock Status Following Adjustments for Retrospective Bias and Inclusion of Trophic Effects

Victor Crecco  
Connecticut Marine Fisheries Division  
333 Ferry Rd..  
Old Lyme CT 06371

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#### SUMMARY

In this report, a time series (1982-2006) of age aggregated (ages 1+) F and stock size estimates was derived for summer flounder from 1982 to 2006. A subset of tuning indices that significantly ( $P < 0.01$ ) predicted the converged portion of the flounder time series (1982-2000) was used to project stock sizes for the non-converged portion (2001-2006) where the presence of retrospective bias from ADAPT was shown to systematically overestimate stock size. In addition, overfishing thresholds ( $F_{msy}$ ,  $B_{msy}$ ) were estimated for flounder by dynamic surplus production models. Finally, I examined the hypothesis that flounder stock rebuilding has been recently halted due mainly to enhanced predation and shifts in environmental factors. The stepwise regression analyses revealed that the recreational cpue index and the NEFSC spring trawl index were selected as the best predictors of mean ages 1+ numbers, biomass and SSB from 1982 to 2000. These regression models accounted for 62 to 89% of the variation in abundance over three converged periods (1982-1998, 1982-1999, 1982-2000), and were then used to project recent (2001-2006) ages 1+ abundance in an effort to address systematic retrospective bias during those years. The ADAPT model overestimated ages 1+ abundance by 35 to 50% in most years after 2000. Based on these analyses, the most reliable time series (1982-2006) of flounder abundance and SSB consisted of the converged portion (1982-2000) from ADAPT plus the predicted abundance and SSB estimates from 2001 to 2006 based on the predictive equations. This time series of stock size estimates was used in all subsequent analyses.

Biomass weighted fishing mortality (F) on ages 1+ flounder was high and variable before 1995, ranging from a low of 0.74 in 1994 to a high of 1.88 in 1988. After 1994, ages 1+ fishing mortality rates dropped considerably and remained relatively stable between 0.38 and 0.54. Ages 1+ flounder biomass (mt) based on ADAPT was relatively high and stable from 1982 to 1987 at around 25 thousand mt, than flounder biomass dropped quickly to below 16 thousand mt from 1988 to 1994. Thereafter stock biomass began to rise and eventually reached about 30 thousand mt by 2001. Ages 1+ stock biomass remained relatively steady at around 30 thousand mt from 2001 to 2005, but the 2006 biomass level fell by 30% to 23 thousand mt. The dynamic Gompertz production model was a good fit to flounder surplus production data, but the model generated an anomalous residual pattern. As a result, several candidate predators (striped bass, bluefish and spiny dogfish) and

environmental variables (mean annual water temperatures and deviations in the winter NAO index) were added to the Gompertz model in a stepwise regression. Striped bass was the only additional variable selected to the Gompertz model at the  $P < 0.02$  level. The extended Gompertz model with striped bass predatory effects explained over 83% of the variability in surplus production and, more importantly, removed the serial residual pattern noted from the original Gompertz model. This extended Gompertz production model was then used to estimate flounder overfishing thresholds ( $F_{msy}$ ,  $B_{msy}$ ). The resulting overfishing threshold ( $F_{msy}$ ) for flounder was 0.64 (80% C.I.: 0.51 to 0.77) and the biomass threshold was 32,500 mt (80% C. I: 25,900-39,200 mt). All of the ages 1+ fishing mortality (FW) rates (biomass weighted) on flounder from 1982 to 1994 exceeded the  $F_{msy}$  threshold of 0.64, indicating that overfishing had occurred on flounder from 1982 to 1994. However, all subsequent FW estimates were below the  $F_{msy}$  threshold, suggesting that overfishing was corrected by additional management measures imposed during the early to mid 1990's. Recent (2002-2005) biomass (mt) levels have approached my  $B_{msy}$  threshold, but the 2006 biomass level of 22,900 mt represented a 30% drop and was well below the  $B_{msy}$  threshold of 32,500 mt. Since fishing mortality rates (FW) have stabilized below  $F_{msy}$  since 1995, the recent lack of stock rebuilding is likely due to enhanced striped bass predation and not overfishing. When the dome-shaped Ricker S-R model was fitted to the flounder S-R data, the model converged and the parameter estimates ( $A$ ,  $K_p$ ) were highly significant ( $P < 0.0001$ ). However, the residual pattern from the Ricker Model looked almost exactly like the atypical residual pattern exhibited by the asymptotic Beverton-Holt S-R model. When striped bass abundance from 1982 to 2006 was added as a second explanatory variable, the extended Ricker model explained 91% of the recruitment variability, all three parameter estimates ( $A$ ,  $K_p$ ,  $c$ ) were highly significant ( $P < 0.0001$ ), and most importantly, the anomalous residual pattern observed in the basic Beverton-Holt and Ricker S-R models virtually disappeared. These findings are consistent with the Predation Hypothesis, indicating that surplus production and the transmission of age 0 recruits to the adult stock has been recently impeded due to a recent rise in striped bass predation. The management implications of successful stock rebuilding of summer flounder in the presence of rising predatory mortality are discussed.

## INTRODUCTION

The most recent stock assessment for summer flounder (Terceiro 2006) concluded that overfishing on the coast-wide stock has occurred since at least 1982. Current (2006) spawning stock biomass based on the 2007 ADAPT (Terceiro 2007) run is about 6% below the biomass threshold, and the current fully recruited fishing mortality rate ( $F$ ) is about 25% above the current  $F_{max}$  threshold of 0.28. As indicated by Terceiro (2006), all ADAPT model runs conducted thus far have exhibited a pronounced and systematic retrospective bias for the terminal (most recent year)  $F$  and stock size estimates. Although the exact origin of retrospective bias is still unclear (ICES 2002), this problem occurs at some level in nearly all catch-at-age models. The ADAPT model for summer flounder almost always underestimated  $F$  and overestimated stock size for fully recruited fish in the last three to five years of the time series by a sizeable amount. Such a large systematic bias greatly confounds our ability to establish conservative quotas on the commercial fisheries and, more importantly, over-inflates the true pace of flounder stock rebuilding toward the SSB threshold of 44,760 mt. Given that the most recent (2002-2006)



biomass estimates from ADAPT have been consistently overestimated, the rate of stock rebuilding since 2002 may be much slower than previously suggested based on output from ADAPT.

The current target and overfishing thresholds for summer flounder are both expressed by an  $F_{max}$  value of 0.28 based on the Thompson-Bell yield-per-recruit (YPR) model (Terceiro 2006). The threshold  $F_{max}$  is assumed to be a suitable proxy for  $F_{msy}$  when the shape of the stock-recruitment relationship is indeterminate. The YPR model assumes no density-dependence and constant age-specific somatic growth and natural mortality rates ( $M$ ). The notion that  $F_{max}$  closely approximates  $F_{msy}$  under most conditions was challenged recently during a review of reference points for summer flounder conducted by the Mid Atlantic Fishery Management Council (MAFMC). Three reports (Gibson 2000; Crecco 2000; Armstrong 2000) from this meeting estimated  $F_{msy}$  for summer flounder based on stock-recruitment and dynamic surplus production models that assume the presence of density-dependent mortality. All of their findings indicated that the range of  $F_{msy}$  thresholds ( $F_{msy}$ : 0.58-0.82) for summer flounder always exceeded the  $F_{max}$  level of 0.28 used in the current assessment as did the range of  $F_{msy}$  levels ( $F_{msy}$  range: 0.45-0.69) reported earlier by Chang and Pacheco (1976). These findings strongly suggest that summer flounder are under some density-dependent control and are thus more resilient to fishing pressure than previously thought.

Over the last seven years, the stock-recruitment (S-R) relationship for flounder has been extensively examined (Terceiro 2000, 2006; Gibson 2000; Crecco 2000). Terceiro (2006) has shown that the residuals from all Beverton-Holt S-R model runs have exhibited a pronounced and consistent serial correlation over time. The residuals were all large and positive from 1983 to 1987, after which nearly all residuals switched to a negative direction. Gibson (2000) also noted a similar residual pattern for the dome-shaped form of the Shepherd (1982) S-R model, indicating that this serial correlation in residuals over time is widespread and not related to the shape of the S-R curve. The other potential cause for serial residuals is that the basic S-R model lacks an additional important explanatory variable such as an environmental or trophic factor. Given the uncertainty and controversy surrounding the effects of retrospective bias in ADAPT on current  $F$  and stock biomass, as well as the persistent occurrence of serial residuals from all current flounder S-R models, I argue here that a thorough examination of these issues are needed even if it occurs outside the normal Peer Review process. The need for such a review may appear unwarranted since the last eight flounder assessments have been upheld by Peer Review (Terceiro 2006). Nevertheless, the ramifications of persistent retrospective bias from ADAPT and residual anomalies from S-R models require more attention here and in future Peer Reviews.

In this report, a time series (1982-2006) of age aggregated (ages 1+)  $F$  and stock size estimates was derived from 1982 to 2006. The  $F$  and stock size estimates were expressed annually as ratios of landings and discards to ages 1+ abundance from the converged portion of the 2007 ADAPT run (Terceiro 2007). A subset of tuning indices that significantly ( $P < 0.01$ ) predicted the converged numbers and biomass time series was then used to project stock sizes estimates for the non-converged portion (2001-2006) of the biomass, stock numbers and spawning stock biomass (SSB) time series. In addition, overfishing thresholds ( $F_{msy}$ ,  $B_{msy}$ ) were estimated for flounder by dynamic surplus production models. Finally, I examined the hypothesis that flounder surplus production and recruitment have recently fallen mainly due to enhanced predation and shifts in environmental factors.

## METHODS

### Method to Adjust Recent Stock Size for Retrospective Bias

Retrospective bias has been persistent in the most recent (> 2001) flounder abundance estimates from the ADAPT model (Terceiro 2006). In an effort to reduce the impact of retrospective bias, I developed a number of linear least squares predictive models based on the tuning indices and the mean ages 1+ biomass, mean ages 1+stock numbers and spawning stock biomass (SSB) values from the converged portion of the 2007 ADAPT run (Terceiro 2007), where retrospective bias was minimal. Annual mean ages 1+ biomass and SSB are direct outputs from ADAPT, but mean ages 1+ stock numbers are not. To estimate mean stock numbers according to the VPA manual (Alan Seaver, NEFSC pers. comm.), ages 1+ stock size estimates at the beginning of each year from ADAPT was multiplied by the quantity  $(1 - \exp(-Z_t)/Z_t)$ , where  $Z_t$  is the instantaneous total mortality estimate (numbers weighted) from ADAPT.

My approach involved the use of the Pearson correlation and stepwise regression analyses to relate all ages 1+ tuning indices in weight and number against average ages 1+ biomass, spawning stock biomass (SSB) and average ages 1+ numbers from the converged portion (1982-2000) of the VPA (Tables 1-3). Both the Pearson correlation and Stepwise regression methods were conducted in the Statistical Analysis System (SAS 2002). A subset of tuning indices was selected from this analysis that best predicted (maximum rsquare) stock size within the converged portion of the VPA. Before the predictive equation was accepted, residual diagnostics was performed on each model to determine whether or not serial correlations were evident between model residuals and time (1982-2000). The residuals from each predictive model were linearly regressed against time (years) and a significant serial correlation coefficient ( $P < 0.05$ ) would indicate an abnormal residual pattern. This would indicate that the current model configuration was either incorrect or an additional explanatory variable was missing from the model. In addition, the partial correlation coefficients were examined for each explanatory variable from the stepwise model. If the model accurately predicted ( $P < 0.01$ ) abundance trends over the converged portion and passed the residual test, it was then used to estimate ages 1+ abundance in number, biomass (mt) and SSB for the non-converged portion (from 2001 to 2006) of the time series.

Since the degree of retrospective bias declines backwards in time from the terminal stock estimate, the exact cutoff for the most recent value in the converged time series is somewhat subjective. It is clear that the degree of retrospective bias in the abundance time series diminished sharply prior to 2001. Thus, the time series of ages 1+ abundance and SSB from 1982-2000 was defined as the converged portion. This converged portion was therefore considered to be the most reliable time series of flounder abundance. This allowed the converged portion to be used as an unbiased dependent variable in the stepwise model, against which the tuning indices can be regressed in the stepwise model. The stepwise model was designed to screen out tuning indices that were poorly correlated ( $P > 0.05$ ) to ages 1+abundance. The definition of the 1982-2000 time series of ages 1+ abundance as a time frame with which to ground truth the tuning indices is arbitrary. Retrospective bias in ages 1+ F and stock size was still discernible albeit at a low level as far back as 1998 (Terceiro 2007). As a result, to further examine how the 1982-2000 time frame might affect the choice of informative indices, the Pearson correlation and stepwise analyses were repeated for ages 1+ abundance and SSB from ADAPT for an additional two periods 1982-1998 and 1982-1999.

The theoretical foundation of this regression approach could be questioned by the fact that trawl survey indices were used to directly tune the 2007 ADAPT run. The potential influence of the tuning indices on the trend in ages 1+ abundance over the converged portion of ADAPT should be minimal. The overall trend in flounder abundance within the converged portion (1982-2000) is mainly influenced by the catch-at-age matrix, whereas more recent abundance estimates are mainly affected by trends in the tuning indices (Mohn 1999). The candidate abundance indices used in the Pearson correlation and stepwise regression analyses included 10 trawl survey indices and one additional recreational cpue index that has not been previously used to tune ADAPT (Tables 1 and 2). The trawl indices included ages 1+ number/tow from the 1982-2006 Massachusetts (MA) spring trawl survey, ages 1+ number/tow in the 1982-2006 Rhode Island fall trawl survey, ages 1+ number/tow in the 1990-2006 Rhode Island fixed station trawl survey, ages 1+ number from the 1984-2006 Connecticut spring and fall trawl surveys, both ages 1+ number and kg/tow from the 1982-2006 NEFSC spring and fall indices, both ages 1+ number and kg /tow from the 1992-2006 NEFSC winter trawl survey, ages 1+ number /tow from the 1989-2006 New Jersey trawl survey, ages 1+ number/tow from 1990 to 2006 for the Delaware trawl survey. A shorter (1990-2006) time series of flounder kg/tow data are also available for the Connecticut spring and fall surveys. At this time, there are no reported biomass (kg/tow) time series for trawl surveys in Massachusetts, Rhode Island, New Jersey and Delaware. A more extensive description of these 10 trawl survey indices is found in the 2006 assessment report (Terceiro 2007).

The new coast-wide recreational cpue index was derived based on a coast-wide recreational catch-effort ratio from 1982 to 2006:

$$\text{RelNt} = \text{ATLN} / \text{Et}. \quad (1)$$

The coast-wide recreational catch (ATLN) (type A, B1 and B2) in numbers and recreational fishing effort (Et, trips) in equation (1) were based on the private boat sector of the MRFSS annual surveys (Table 1). Flounder catch and fishing effort data were confined to the private boat sector for two reasons. First, the flounder total catch and total effort estimates each year were derived with relatively high precision (proportional CV < 5% of the mean). Second, the private boat sector of the fishery is highly mobile and capable of catching flounder of all sizes throughout their range.

A second time series (1982-2006) of relative abundance indices in weight (RelWt) was also derived as a ratio of recreational catches (A, B1, B2) in weight (RelWt) to fishing effort (Et) (Table 2). The MRFSS has monitored weight (kg) data from only the harvest (A, B1) so weight data from released fish (B2) are not available. As a result, average weight for A, B1 and B2 catches was estimated indirectly as the average weight (kg) per flounder taken from the NEFSC spring and fall surveys from 1982-2006. The average weight (avwt) of a flounder was derived annually from the NEFSC spring and fall surveys as the average kg/tow index divided by the average number/tow index. The resulting weight index (RelWt) for the recreational fishery was expressed annually as the product of the relative abundance index in number (RelNt) and the average weight (avwt) from the spring and fall NEFSC trawl surveys.

The proposed recreational indices for flounder (RelNt and RelWt) are fishery dependent and thus not entirely independent of the total (sport, commercial and discards) coast-wide landings. However, the problem of colinearity between recreational indices and total coast wide landings should be relatively minor for two reasons. First, auto-correlation between the relative abundance

indices (RelNt and RelWt) and total harvest is minimized by the fact that private boat recreational catches (type A, B1 and B2) were used here rather than harvest (type A and B1) to derive the RelNt. The recreational catches are usually three to four times higher each year than the harvest after 1993. Second, in order to derive the recreational indices, the private boat catches (A, B1, B2) in the MRFSS were further divided by private boat fishing effort (Et). Note that the trend in Et from 1982 to 2006 was inversely related ( $r = -0.53$ ,  $P < 0.01$ ) to total coast-wide flounder harvest.

## RESULTS

Each of the ages 1+ abundance indices for the three converged periods 1982-1998, 1982-1999 and 1982-2000 was correlated to the corresponding ages 1+ abundance in number and weight (mt) based on ADAPT (Tables 4 and 5). Regardless of the converged time frames (1982-1998, 1982-1999, 1982-2000), ages 1+ number/tow from the NEFSC spring and winter surveys, as well as the Massachusetts, Rhode Island and Delaware surveys were poorly ( $P > 0.05$ ) correlated to ages 1+ stock size in number from the three converged portions (Table 4). The Rhode Island fixed station survey and Connecticut fall survey of ages 1+ abundance were significantly correlated ( $P < 0.03$ ) to the 1982-2000 and 1982-1999 abundance estimates but not to ages 1+ abundance from the 1982-1998 period. All of the other surveys (NEFSC fall, Connecticut spring, New Jersey and the coast-wide recreational cpue (RelNt) were significantly ( $P < 0.05$ ) correlated to ages 1+ abundance across the three converged periods. However, recreational cpue in number was consistently the most highly ( $P < 0.0001$ ) correlated index to ages 1+ abundance across the three converged periods.

Results of the correlation analyses for biomass (Table 5) revealed that the NEFSC winter biomass indices were poorly correlated to ages 1+ biomass from the converged portions, whereas the Connecticut spring and fall indices were significantly ( $P < 0.05$ ) correlated to ADAPT biomass from 1982 to 1999 and 1982-2000, but not for the period 1982-1998. The NEFSC spring and fall biomass (kg/tow) indices and the recreational cpue index in kg (RelWt) were highly correlated ( $P < 0.05$ ) to ages 1+ biomass across the three converged periods (Table 4). The recreational index (RelWt) always exhibited the highest correlation ( $P < 0.0001$ ) to ages 1+ abundance across the three converged periods.

Ages 1+ biomass (mt) from the converged portion (1982-2000) was highly correlated ( $P < 0.0001$ ) to spawning stock biomass (SSB). The correlation matrix (Table 5) indicated that all biomass indices except the NEFSC winter survey were significantly correlated to SSB levels from 1982 to 2000. As in the other comparisons, the recreational cpue (RelWt) was the most highly correlated ( $P < 0.0001$ ) time series to the SSB for the converged portion (1982-2000).

Results from the stepwise regression that related ages 1+ abundance from the converged portion to the tuning indices revealed that the recreational cpue index was the only index selected as the best predictor of mean ages 1+ numbers, accounting for 62 to 68% of the variation in abundance over the three converged periods (1982-1998, 1982-1999, 1982-2000) (Table 6). None of the ten trawl survey indices were selected as a second predictor variable from the stepwise regression. The predictive equation that explained 68% of the variation in abundance from 1982-2000 (Figure 1) was:

$$\text{PredN} = 5.28 + 26.38 * \text{RelNt} . \quad (2)$$

The resulting residual pattern from equation (2) was random over time ( $P < 0.15$ ) (Figure 2), indicating that this predictive model was unbiased and a reliable predictor of abundance at least from 1982-2000. As a result, this model was used to predict ages 1+ flounder abundance from 2001 to 2006 in an effort to adjust recent ages 1+ abundance for systematic retrospective bias. Severe overestimation of ages 1+ stock size from ADAPT was clearly evident in recent years (2001-2006) (Figure 3). The lowest systematic bias occurred in 2001 (23.7%) and highest took place in 2003 (53.9%). The percentage bias for ages 1+ abundance was 50.5% in the terminal (2006) year. The most reliable time series (1982-2006) of ages 1+ abundance was considered to be the converged portion (1982-2000) of ages 1+ abundance from ADAPT plus the predicted ages 1+ abundance estimates from 2001 to 2006 based on equation (2).

Results from the stepwise regression of ages 1+ biomass (mt) from the converged portion and the tuning indices revealed that the recreational cpue index in weight (RelWt) and the NEFSC spring index (kg/tow) were together the best predictors of ages 1+ biomass for the three converged periods (1982-1998, 1982-1999, 1982-2000), each accounting for 87 to 88% of the variation (Table 6). The partial correlation coefficients were always much higher for the recreational cpue (0.77-0.80) than for the NEFSC spring indices (0.09-0.11). The predictive equation for the converged period 1982-2000 was:

$$\text{PredW} = 4.30 + 4.94 * \text{NEFSC} + 23.10 * \text{RelWt}, \quad (3)$$

which explained 88% of the variation in ages 1+ stock biomass from 1982-2000 (Figure 4). A plot of residuals was random ( $P < 0.60$ ) across the time series (Figure 5), indicating that the predictive model (equation 3) was unbiased. As a result, this model was used to predict ages 1+ flounder biomass from 2001 to 2006 in an effort to adjust ages 1+ biomass for retrospective bias (Figure 6). The percentage bias between the ADAPT stock biomass and the predicted (PredW) biomass from equation (3) was relatively low (1.5%) in 2001, but the bias generally increased in magnitude over time to the highest (45.5%) level in 2006, indicating that the terminal stock biomass estimate is severely overestimated by ADAPT. The most reliable time series (1982-2006) of ages 1+ biomass for further analyses was the converged portion (1982-2000) of ages 1+ biomass from ADAPT plus the predicted ages 1+ biomass estimates from 2001 to 2006 based on equation (3). This biomass time series was used in all subsequent surplus production modeling.

Stepwise regression analyses of SSB (mt) relating the converged portion of ADAPT to the tuning indices also revealed that the recreational cpue index in weight (RelWt) and the NEFSC spring index (kg/tow) were the best predictors of flounder SSB for the 1982-2000 period (Table 6), accounting for 79% of the variation in SSB (Figure 7). The partial correlation coefficient was much higher for the recreational cpue (0.67) than for the NEFSC spring indices (0.11). The predictive equation for SSB over the converged period 1982-2000 was:

$$\text{PredSSB} = 4.40 + 5.90 * \text{NEFSC} + 19.26 * \text{RelWt}. \quad (4)$$

The residuals based on the difference between observed and predicted SSB (PredSSB) were random ( $P < 0.17$ ) across the time series (Figure 8), indicating that the predictive model (equation 4) was unbiased. As a result, this model was used to predict flounder SSB from 2001 to 2006 in an effort to adjust SSB for retrospective bias (Figure 9). The percentage bias between the ADAPT stock biomass and the predicted (PredW) biomass from equation (4) was relatively low (-5.8%) in 2001, but the bias generally rose in magnitude over time to the highest (47.3%)

level in 2006. Based on this analysis, the most reliable time series (1982-2006) of flounder SSB for further analyses was the converged portion (1982-2000) of SSB from ADAPT plus the predicted SSB estimates from 2001 to 2006 based on equation (4) (Table 3). This SSB time series was used in all subsequent stock-recruitment analyses.

### **Approach to Estimate ages 1+ F and Surplus Production**

In this analysis, age aggregated (ages 1+) fishing mortality ( $F_t$ ) was derived annually on summer flounder from 1982 to 2006. The theoretical underpinnings of our approach is based on a simple re-arrangement of the Baranov catch equation (Ricker 1975, page 13, equation 1.17) with respect to  $F$ :

$$F = \text{Catch} / \text{Mean Stock Size}, \quad (5)$$

where: mean stock size is typically expressed as the average stock size in years  $t$  and  $t+1$ . The ages 1+  $F_t$  estimates were based on the ratio of ages 1+ coast-wide (commercial and sport plus discards) landings (numbers) of flounder in year  $t$  (Catch $_t$ ) to the corresponding ages 1+ abundance estimates ( $N_t$ ,  $N_{t+1}$ ) in year  $t$  and  $t+1$ :

$$F_t = \text{Catch}_t / [(N_t + N_{t+1})/2], \quad (6)$$

where:  $N_t$  and  $N_{t+1}$  are the flounder ages 1+ abundance estimates from the converged portion (1982-2000) of ADAPT whereas  $N_t$  values from 2001 to 2006 represent the predictive values (equation 2). The landings and discards (Catch $_t$ ,  $n \cdot 1000$ ) of ages 1+ flounder (Table 2) in the numerator of equation (6) were derived earlier in the 2007 stock assessment (Terceiro 2007). Equation (6) is very similar to the equation introduced earlier by Sinclair (1998) except that he estimated relative exploitation:

$$\text{Relu} = \text{Catch} / \text{Rel}N_t \quad (7)$$

instead of  $F$ . Because the 2007 abundance estimate ( $N_t$ ) is not yet available, the  $N_{t+1}$  value a year later in 2006 was assumed to be the same as the 2006  $N_t$  abundance estimate. Ages 1+  $F$  estimates via equation (6) do not consider temporal and spatial shifts in the age structure, so this approach is designed only to monitor age aggregated  $F$  values across time (1982-2006). Thus, the  $F_t$  values are uninformative about year-class and age-specific changes in  $F$  over the time series. However, since  $F_t$  estimates from equation (6) are expressed as a ratio of annual harvest to average abundance, the trend in ages 1+  $F$  is not confounded by the assumption of constant natural mortality ( $M = 0.2$ ) used explicitly to derive  $F$  estimates ( $F = Z - 0.2$ ) in ADAPT and in other catch-age models.

Another time series (1982-2006) of biomass weighted  $F$  estimates for ages 1+ flounder was estimated from 1982 to 2006 as a ratio of ages 1+ landings and discards ( $mt$ ) to the average ages 1+ biomass estimates in year  $t$  (Biot) and  $t+1$  (Biot+1). As with the other analysis, Biot and Biot+1 represent the flounder ages 1+ biomass estimates from the converged portion (1982-2000) of ADAPT whereas the Biot estimates from 2001 to 2006 were derived from the predictive equation (equation 3).

A time series (1982-2006) of surplus production estimates in year t (SURPt) was also derived for flounder. As in Jacobson et al (2002), the SURPt values were expressed each year by subtracting flounder biomass in year t (BIOt) from the biomass in year t+1 (BIOt+1), and then adding the coast-wide harvest and discards (mt) (catcht):

$$\text{SURPt} = \text{BIOt+1} - \text{BIOt} + \text{Catcht}. \quad (8)$$

### Overfishing Thresholds (Fmsy, Bmsy)

Surplus production estimates have been used to monitor trends in per capita stock productivity for many exploited finfish populations (Jacobson et al 2002). Having a time series (1982-2006) of flounder surplus production (SURPt) (Table 7) and stock biomass estimates in year t (Biot) (Table 7), updated Fmsy and Nmsy thresholds were estimated for flounder using the dynamic version of the Gompertz external surplus production model (Quinn and Deriso 1999; Jacobson et al 2002). Like stock-recruitment models, the theoretical foundation of production models assumes the existence of compensatory density-dependent mortality for finfish populations, a position widely held by most fish population ecologists (Wahle 2003). We selected the Gompertz form over the more widely used logistics equation because Yoshimoto and Clarke (1993) reported that under simulation conditions, the Gompertz model produced more realistic (positive) and stable overfishing thresholds than the logistics model. In the asymmetrical Gompertz model, surplus production estimates (SURPt) from 1982-2006 were regressed against biomass (Biot) and the product of the log flounder biomass and biomass (LogBiot\*Biot) in a two variable linear regression model without a y-axis intercept:

$$\text{SURPt} = a * \text{Biot} + b * ((\text{LogBiot}) * \text{Biot}), \quad (9)$$

where: K – theoretical carrying capacity (mt) =  $\exp(a/b)$ ;  
 MSY- maximum sustainable yield (mt) =  $(-b * K)/2.72$ ;  
 Bmsy – stock size (mt) at MSY =  $K / 2.72$ ;  
 Fmsy – instantaneous fishing mortality at MSY =  $\text{MSY} / \text{Bmsy}$ ;  
 Fcoll – instantaneous fishing mortality at stock collapse =  $\text{Fmsy} * 2.72$ .

Our ability to estimate precise Fmsy and Bmsy values in surplus production models are often plagued by the presence of outliers caused by moderate to high measurement errors. To minimize the effects of outliers, the Gompertz model (equation 9) was fitted as a linear robust regression model using the least trimmed squares regression (LTS) objective function as recommended by Rousseeuw and Van Driessen (2000). The parameter estimates (a, b) and resulting reference points (Fmsy, Bmsy, Fcoll) from the dynamic production model (equation 9) were derived from the ROBUSTREG procedure contained in the Statistical Analysis System (SAS 2002). The parameter estimates (a, b) and their standard errors based on least squares (LS) are highly prone to the presence of outliers. With robust linear regression like LTS, outlying observations are identified and automatically down-weighted, resulting in higher precision and greater overall stability of the parameter estimates (a, b) over those derived from ordinary least squares.

Before the overfishing thresholds ( $F_{msy}$ ,  $B_{msy}$ ) were estimated via equation (9), the pattern of residuals was examined for the presence of serial correlations over time. The residuals from an unbiased model should be distributed randomly over time. By contrast, a significant ( $P < 0.05$ ) correlation between residuals and time (1982-2006) would indicate model misspecification. A serial correlation occurs when the residuals are all in one direction during say the first half of the time series then they switch abruptly in the opposite direction thereafter. This anomalous residual pattern could be due to an incorrect configuration of the production model (i. e. Logistics versus Gompertz), or perhaps, the model lacks an important explanatory variable. If the parameter estimates ( $a$ ,  $b$ ) of the model are statistically significant ( $P < 0.05$ ), and if the residual pattern from the model exhibited no serial correlation, the model was considered unbiased and used to estimate overfishing ( $F_{msy}$ ,  $B_{msy}$ ) thresholds.

To examine the hypothesis that flounder surplus production has recently been eroded by trophic and environmental factors, candidate predators such as striped bass, bluefish and spiny dogfish abundance (pred term) were included in the production model as an extra independent variable (Table 3). In addition, environmental variables such as annual mean water temperature and deviations in the winter North Atlantic Oscillation (NAO) index (environ term) from 1981 to 2006 (Table 3) were also added to the external production model:

$$SURPt = a*Biot + b * ((LogBiot)*Biot) + c*(Pred of Environ), \quad (10)$$

in a stepwise regression fashion. Since all female flounder reach sexual maturity by age 2 (Almeida et al 1992), water temperature and winter NAO values were lagged t-1 and t-2 years to coincide with flounder recruitment to the adult stock. Environmental disturbances have been proposed as a major process structuring ecological systems (Hollowed et al 2000), both by causing direct mortality and by changing the carrying capacity of the ecosystem. Bluefish, striped bass and spiny dogfish are major inshore finfish predators that have recently risen sharply in abundance along the Atlantic coast. Moreover, these finfish predators overlap the spatial and temporal distribution of flounder, and all are considered, to some extent, as potential candidate predators on flounder (Rountree 1999). Striped bass is regarded as a voracious predator from the Mid and North Atlantic on menhaden, gizzard shad and herring (Hartman 1993). Larger (> 70 cm) striped bass, however, have been reported to switch their prey preference from herring and small menhaden to spot, flounder and weakfish in Chesapeake Bay (Hartman and Brandt 1995; Walter and Austin 2003). Bluefish (*Pomatomous saltatrix*) also prey upon a variety of finfishes including flounder throughout the Atlantic coast (Bowman et al 2000). Dogfish (*Squalus acanthias*) are found coast-wide and are regarded as a primary finfish predator of juvenile summer flounder (Rountree 1999).

Statistical evidence consistent with the predation hypothesis would be evident if the slope (c) for predation effects in equation (10) was negative and statistically significant ( $P < 0.05$ ). This would imply that enhanced predation has eroded flounder surplus production independent of fishery effects. Moreover, if the slope for predation effects is significant, the inclusion of the extra predation term in the model can greatly enhance the precision around the (a) and (b) parameters of equation (10), thus allowing more precise estimates of  $F_{msy}$  and  $B_{msy}$  thresholds. To test for potential joint effects of fishing (F) and trophic interactions on flounder productivity, residual plots against time were examined for the presence of serial correlations. Further statistical support for the predation hypothesis would exist, if the pronounced serial correlation



evident in the basic production model (equation 9) should disappear following the addition of predation effects to the model (equation 10).

Annual changes in coast-wide striped bass abundance (ages 7+) in numbers (Table 3) have been monitored annually from 1988 to 2006 by the ratio of ages 7+ harvest to the tag-based F derived from the catch equation approach (Versak 2007). In addition, a time series (1982-2006) of ages 8+ striped bass abundance has been derived recently from the Statistical Catch-at-Age model (Nelson 2007). Annual changes in spiny dogfish and bluefish from 1982 to 2006 were indexed here as cpue based on the coast-wide recreational catches in number (A, B1, B2) and coast-wide effort (trips) from the private boat fishery in the MRFSS surveys (Table 3). These trends in coast-wide recreational cpue of dogfish and bluefish were assumed to be informative about coast-wide changes in these stocks from 1982 to 2006. A time series (1982-2006) of average annual surface water temperatures was taken from a continuous temperature recorder in Long Island Sound located at the Millstone Nuclear Power Station, Waterford CT. Annual deviations in the winter NAO indices from 1982 to 2006 were taken from the NOAA web site.

### Stock-Recruitment Effects

Over the last seven years, the stock-recruitment (S-R) relationship for flounder has been extensively examined (Terceiro 2000, 2006; Gibson 2000; Crecco 2000). Terceiro (2006) has argued that the asymptotic Beverton-Holt S-R model should be chosen over the parabolic Ricker S-R model based on theoretical grounds, despite the fact that the parabolic model was a better fit to stock-recruitment data (Gibson 2000). Terceiro (2006, 2007) has repeatedly shown that the residuals from all Beverton-Holt S-R model runs have exhibited a persistent serial correlation over time. The residuals were all high and positive from 1983 to 1987, then nearly all subsequent residuals switched to a negative direction. Since Gibson (2000) noted a similar anomalous residual pattern when flounder S-R data were fitted to the dome-shaped form of the Shepherd (1982) S-R model, this serial residual pattern is widespread and not related directly to the shape of the S-R curve. The other potential cause for the serial correlation in residuals is that the basic S-R model may lack an additional important explanatory variable such as environmental or predatory effects.

In this report, the shape and residual pattern of the flounder stock-recruitment relationship was further explored with the flexible Shepherd (1982) S-R model:

$$\text{Rec} = A * \text{SSB} / (1 + (\text{SSB} / K_p)^b), \quad (11)$$

where: A = the magnitude of compensatory reserve;

K<sub>p</sub> = the flounder spawning stock biomass (mt) at which compensatory effects dominate;

b = the degree of compensatory density-dependent mortality;

Rec = estimated age 0 recruits from the most recent ADAPT run (Terceiro 2007) (Table 3);

SSB = estimated SSB from the converged portion (1982-2000) of ADAPT plus predicted SSB from the stepwise model from 2001-2006 (Table 3).

If the b parameter estimate in equation (11) is less than 1.0, the curve approximates a power function. If (b) is equal to 1.0, the S-R curve is consistent with the asymptotic Beverton-Holt model, whereas a (b) estimate greater than 1.0 is consistent with the parabolic Ricker type S-R curve. The entire time series (1982-2006) of flounder recruitment (Rec) based on the 2007

ADAPT run (Terceiro 2007) was fitted to equation (11) because Terceiro (2006) has shown that the degree of retrospective bias on recent recruitment estimates from ADAPT was relatively small. In order to explore the residual patterns from the Beverton-Holt and Ricker type S-R models, the S-R data were fitted to equation 11 holding the (b) parameter constant at 1.0 and 2.0, respectively. The remaining parameter estimates (A, Kp) from the S-R model (equation 11) were derived from the NLIN procedure (marquardt algorithm) contained in the Statistical Analysis System (SAS 2002).

Given the likely presence of outliers in the S-R data, the Shepherd S-R model was fitted as a nonlinear robust regression using the iterative reweighted least squares method outlined by Holland and Welsch (1978). The algorithm and rationale for this approach is described in SAS (2002). This re-weighting scheme is designed to detect outliers, thereby allowing the down weighting of S-R data from certain years in the model where model residuals, regardless of direction, exceeded a previously defined threshold level. As indicated by Holland and Welsch (1978), the choice of a threshold is subjective and always represents a trade-off between minimizing the variances around the parameters (A, Kp) and at the same time generating globally converged parameter estimates. As suggested by Holland and Welsch (1978), a range of threshold estimates was used initially and the final threshold value was selected that satisfied the trade-off between global convergence of all parameter estimates and parameter estimates with maximum precision and minimum variance. The two-step re-weighting approach always produced converged estimates (global estimates) that were within 10% of the parameter estimates (A, Kp) derived by the nonlinear least squares approach. However, the standard errors about the estimates based on iterative re-weighting were always 30 to 45% lower than the standard errors from the least squares method.

To examine for potential predatory and environmental effects on flounder recruitment and on the residuals from the S-R model, the Shepherd S-R model (equation 11) included an extra exponent (c) reflecting potential predation (pred) and environmental (environ) effects:

$$\text{Rec} = A * \text{SSB} / (1 + (\text{SSB} / \text{Kp})^{**b}) * \exp(c * \text{pred}, \text{environ}). \quad (12)$$

As in the surplus production analyses, candidate predators (pred) included striped bass, bluefish and spiny dogfish abundance (Table 3) were added separately to the model. Potential environmental variables (environ) included annual water temperature and deviations in the winter North Atlantic Oscillation (NAO) index. Statistical evidence consistent with the predation and environmental hypotheses would exist if the additional exponent (c) for predation and environmental effects in equation (12) was negative and statistically significant ( $P < 0.05$ ). This would imply that biotic and abiotic factors external to the fishery have reduced recent age 0 recruitment over time. Further statistical support for the predation and environmental hypotheses would be evident, if the serial correlation in residuals evident in the basic Shepherd S-R model (equation 11) disappeared following the addition of predation or environmental effects to the S-R model (equation 12).

## RESULTS

### **Ages 1+ Fishing Mortality (F) and Surplus Production (SURPt)**

Ages 1+ fishing mortality estimates (FN) (catch weighted) were derived from 1982 to 2006 as the ratio of total annual landings (including discards) to average (t, t+1) ages 1+ abundance (Table 7). These FN estimates on ages 1+ flounder were high and variable before 1995, ranging from a low of 0.74 in 1982 to a high of 2.22 in 1988 (Figure 10). After 1994, ages 1+ fishing mortality rates dropped considerably and remained relatively stable at around 0.50 thereafter.

Ages 1+ abundance in number from ADAPT was relatively high from 1982 to 1984, then flounder abundance fell quickly to the lowest level in the time series at 9.5 million fish in 1989 (Table 7, Figure 10). Ages 1+ abundance rose steadily after 1988 to a peak abundance of 33 million fish in 2000. Note that ages 1+ flounder stock sizes from 2001 to 2006 were predicted from equation 2 in order to adjust for retrospective bias from ADAPT. These predicted biomass levels fell slightly after 2000 and remained relatively stable thereafter at around 25 million fish.

Ages 1+ fishing mortality (FW) (biomass weighted) on flounder were again high and variable before 1995 (Table 7), ranging from a low of 0.74 in 1994 to a high of 1.88 in 1988 (Figure 11). Biomass weighted FW levels on ages 1+ flounder dropped steadily from 1994 through 2002 to below 0.38, but FW levels rose slightly thereafter to a peak of 0.54 in 2006.

Ages 1+ flounder biomass (mt) based on ADAPT was relatively high and stable from 1982 to 1987 at around 25 thousand mt, then flounder biomass dropped quickly to below 16 thousand mt from 1988 to 1994 (Table 7, Figure 11). Thereafter stock biomass began to rise and eventually reached about 30 thousand mt by 2001. Ages 1+ stock biomass remained relatively steady at around 30 thousand mt from 2001 to 2005, but the 2006 biomass level fell by 30% to 23 thousand mt. Note that stock biomass from 2001 to 2006 was predicted by equation 3 in order to adjust for severe retrospective bias from ADAPT.

Surplus production (SURPt) estimates (mt) for flounder were derived via equation 8 from 1982-2006 (Table 7, Figure 12). Surplus production was highest during the early to mid-1980's despite the presence of high fishing mortality (F) rates (Figures 10 and 11). SURPt levels did fall steadily after 1986, presumably due to high fishing mortality, to the lowest level in the time series in 1990. SURPt levels for flounder increased by 20 to 30% after 1991 but never recovered to the pre 1987 levels despite the presence of relatively low and steady fishing mortality from 1997 to 2006 (Figures 10 and 11).

### **Overfishing Thresholds (Fmsy, Bmsy)**

To estimate overfishing thresholds (Fmsy, Bmsy), flounder surplus production estimates from 1982 to 2006 (Figure 12) were fitted to flounder biomass via the Gompertz dynamic production model (equation 9). The Gompertz model accounted for 80% of the variation in surplus production and the parameter estimates (a, b) were determined with high precision (Table 8). However, the plot of model residuals indicated a severe ( $P < 0.01$ ) serial correlation over time (Figure 13), indicating model misspecification. The residuals were large and positive from 1982 to 1986, then the residuals for most years shifted in the opposite direction. Even when the Logistics form of the surplus production model was used instead of Gompertz, the same serial residual pattern persisted over time, indicating that the residual problem was not due to the

configuration of the production model. Due to the clear residual problem with the basic Gompertz and Logistics models, they were not used to estimate overfishing thresholds for flounder.

Since a serial residual pattern persisted in the basic (equation 9) production model, the environmental-dependent form of the Gompertz model (equation 10) was used in the linear stepwise regression model with potential explanatory variables such as striped bass, bluefish and spiny dogfish, mean annual water temperature and winter NAO. The stepwise model selected striped bass abundance (either tag-based or SCAM estimates) as the only negative and significant ( $P < 0.01$ ) explanatory variable (Table 9). No other variables were chosen at the  $P < 0.05$  level.

When this extended production model was fitted to the robust regression procedure, all parameters (a, b, c) estimates were highly significant ( $P < 0.0001$ ) (Table 8). This production model with striped bass effects explained 83% of the variation in flounder surplus production from 1982-2006. Moreover, the serial residual pattern present in the basic production model virtually disappeared (Figure 14) ( $P < 0.49$ ) when striped bass abundance was added as a second variable to the production model. These findings are consistent with the Predation Hypothesis, indicating that flounder productivity has recently been eroded by enhanced striped bass predation.

This extended production model with striped bass predatory effects was then used to estimate flounder overfishing thresholds ( $F_{msy}$ ,  $B_{msy}$ ). The resulting overfishing threshold ( $F_{msy}$ ) for flounder was 0.64 (80% C.I.: 0.51 to 0.77) and the biomass threshold was 32,500 mt (80% C. I: 25,900-39,200 mt) (Table 8). All of the ages 1+ fishing mortality (FW) rates (biomass weighted) on flounder from 1982 to 1994 exceeded the  $F_{msy}$  threshold of 0.64 (Figure 16), indicating that overfishing had occurred on flounder from 1982 to 1994. However, all subsequent FW estimates were below the  $F_{msy}$  threshold, suggesting that overfishing was corrected by additional management measures imposed during the early to mid 1990's. By contrast, although ages 1+ biomass (mt) has risen steadily since 1989 (Figure 15), except for the 2001 ages 1+ stock biomass of 33,900 mt, all other ages 1+ biomass estimates have remained below the estimated  $B_{msy}$  threshold of 32,500 mt (Figure 16). Recent (2002-2005) biomass levels have approached the  $B_{msy}$  threshold, but the 2006 biomass level of 22,900 mt represented a 30% drop and is well below the  $B_{msy}$  threshold of 32,500 mt. Since fishing mortality rates (FW) have stabilized below the  $F_{msy}$  threshold since 1995, the recent lack of stock biomass growth is likely due largely to enhanced striped bass predation and not overfishing.

### **Stock –Recruitment Effects**

The Beverton-Holt version ( $b = 1.0$ ) of the Shepherd S-R (equation 11) model was fitted to age 0 recruitment and spawning stock biomass (mt) estimates (Table 3) from 1982-2006 using iterative reweighted least squares regression. The S-R model converged but the parameter estimates ( $A$ ,  $K_p$ ) did not differ significantly ( $P < 0.05$ ) from zero (Table 10, Figure 17). Moreover, the residual plot over time indicated the presence of significant ( $P < 0.0005$ ) serial correlation in the residuals (Figure 18). The residuals were large and positive from 1982 to 1987 then the residuals became smaller and mostly negative (Figure 17), indicating model misspecification.

When the Ricker version ( $b = 2.0$ ) of the S-R model was fitted to the S-R data (Table 3), the model converged and the parameter estimates ( $A$ ,  $K_p$ ) were highly significant ( $P < 0.0001$ )

(Table 10, Figure 19). However, the residual pattern from the Ricker Model (Figure 20) looked almost exactly like the atypical residual pattern from the Beverton-Holt S-R model. When bluefish and dogfish abundance, as well as lagged (t-1, t-2) mean annual temperature and lagged winter NAO were added separately to the extended Ricker model (equation 12), the resulting exponent (c) for each of these variables did not differ significantly ( $P < 0.05$ ) from zero. However, when striped bass abundance was added as a second explanatory variable, the model explained 91% of the recruitment variation, all three parameter estimates (A,  $K_p$ , c) were highly significant ( $P < 0.0001$ ) (Table 10, Figure 21) and, most importantly, the anomalous residual pattern seen in the basic Beverton-Holt and Ricker S-R models virtually disappeared (Figure 22). These findings are consistent with the Predation Hypothesis, indicating that the transmission of age 0 recruits to the adult stock has been recently impeded due to enhanced striped bass predation.

### **Management Implications and Scientific Advice**

My results indicate that density-dependent processes play a much greater role in stabilizing flounder abundance than is assumed in the current stock assessment (Terceiro 2006). The main conclusion from the last stock assessment (Terceiro 2006) is that flounder have been overfished since at least 1982 despite the implementation of catch quotas on commercial fisheries beginning in 1990 and a steady decline in fishing mortality (F) since 1995. The current assessment results show that flounder stock biomass has not yet reached the biomass threshold of 44,760 mt because F has remained too high. The important conclusion from the last assessment that summer flounder have remained overfished for at least 25 years largely depends on the degree of compensatory density-dependent mortality inherent to the flounder stock. It is widely recognized that the magnitude of  $F_{msy}$  and the level of resilience to exploitation depends on the degree of density-dependent compensation (Quinn and Deriso 1999). The current assessment has assumed that little if any compensation occurs for flounder and therefore used an  $F_{max}$  of 0.28 from the YPR model as a proxy for  $F_{msy}$ . In this report,  $F_{msy}$  was estimated directly to be 0.64 based on the extended Gompertz model that assumes moderate to high density-dependent compensation. My findings indicate that the flounder were overfished before 1995 when ages 1+ F estimates exceeded my  $F_{msy}$ , but that extensive management measures imposed during the early to mid 1990's enabled F to drop below the overfishing threshold. The very strong fit of both the production and dome-shaped Ricker models suggests that moderate to strong density-dependent mortality is evident in the summer flounder stock, allowing the flounder stock to absorb the effects of relatively high ( $F < 0.64$ ) fishing mortality. My findings of moderate to high density-dependent compensation for summer flounder is consistent with their suite of life history traits that include early female maturation (age 2) (Almeida et al 1992), relatively rapid somatic growth and a relatively short lifespan (12 years) (Dery 1988). My  $F_{msy}$  threshold of 0.64 is well within the range of  $F_{msy}$  levels reported from four earlier studies (Chang and Pacheco 1976; Gibson 2000; Crecco 2000; Armstrong 2000). They reported  $F_{msy}$  thresholds ( $F_{msy}$ : 0.45-0.82) for summer flounder that always exceeded the  $F_{max}$  level of 0.28 used in the current assessment, and were clearly closer to my  $F_{msy}$  estimate of 0.64 based on the Gompertz production model. These earlier findings are consistent with my results, suggesting that summer flounder are under at least partial density-dependent control and are thus more resilient to fishing pressure than previously thought.

The possibility for further rebuilding of summer flounder biomass beyond the  $B_{msy}$  level of 32,500 mt over the next five years is more uncertain due to the recent rise in predatory mortality. My findings indicate that the rapid build-up in stock biomass inferred from 2001 to 2006 based on ADAPT is overstated due to persistent retrospective bias. When the recent (2001-2006) abundance estimates from ADAPT were adjusted downward by 20 to 50% to account for retrospective bias, the rate of stock rebuilding after 2000 was minimal. My results suggest that enhanced predation by striped bass on young flounder provides the most plausible explanation for the recent stagnation of flounder population growth and age 0 recruitment to the adult stock. Moreover, the inclusion of striped bass effects in both the extended Ricker S-R and Gompertz models was the only variable examined thus far that removed the recurring residual problem that constantly plagued the Beverton-Holt S-R model in previous assessments (Terceiro 2006). The fact that the exponent for striped bass predation was negative and highly significant ( $P < 0.0001$ ) in both the extended Ricker S-R and Gompertz surplus production models is not surprising, given that annual changes in age 0 recruitment largely govern the net changes in fish surplus production (Walters and Martell 2004).

It is widely recognized that statistical evidence (regression and production models) alone does not demonstrate causality, but recent empirical evidence is wholly consistent with the Predation Hypothesis involving striped bass. Due to the success of striped bass management, striped bass abundance has risen steadily to record levels in mid and north Atlantic coastal waters from 1993 to 2006 (Crecco 1994; Nelson 2007). The results of coast-wide tagging of striped bass since 1987 indicate that abundance of ages 7+ stripers has risen nearly four-fold coast-wide from 1998 to 2006 (Versak 2007). Moreover, coast-wide tag returns from Maine to North Carolina indicate that striped bass are found mostly in state waters (Versak 2007) that clearly overlap the temporal and spatial distribution of summer flounder. Since striped bass are known to consume finfish prey up to 60% of their own body length (Manooch 1973), it is reasonable to hypothesize that striped bass abundance has reached such high abundance that flounder population growth would be severely impeded by enhanced striped bass predation. Larger ( $> 70$  cm) striped bass have been reported to switch their prey preference from herring and small menhaden to spot, flounder and weakfish in Chesapeake Bay (Hartman and Brandt 1995; Walter and Austin 2003). Striped bass grow rapidly to a large size ( $>90$  cm) that can easily prey on smaller adult flounder, are highly piscivorous (Hartman 1993), and are efficient diurnal and nocturnal predators along inshore waters (Nelson et al 2006). Recent studies on river herring and American shad in the Connecticut River (Savoy and Crecco 2004), as well as the coast-wide weakfish stock assessment (Kahn et al 2005; Uphoff 2005) concluded that enhanced striped bass predation was the most reasonable hypothesis to explain the unexpected declines of these finfishes under low exploitation. Nelson et al (2006) reported that the average consumption level (mt) of Atlantic menhaden by striped bass along the Massachusetts coast from 1997 to 2000 was 12 times greater than the total menhaden commercial landings (mt) from Massachusetts. Finally, Bax (1998), in a comprehensive review of finfish predatory effects, noted that finfish predation accounts for between 2 and 35 times the finfish losses (mt) reported annually to commercial fisheries throughout the world.

The management implications and long-term prognosis for flounder in the presence of enhanced striped bass predation are challenging and somewhat ambiguous. In the current assessment (Terceiro 2006), natural mortality ( $M$ ) in both the ADAPT and YPR models was assumed constant at 0.20 for all ages and years. It is widely recognized from recent multispecies models (Hollowed et al 2000; Walters et al 2005) that the scientific foundation supporting the

constant  $M$  assumption in single species assessments is highly questionable, particularly for younger fish. Moreover, unless long-term tagging studies are conducted, there is no other way to scientifically verify the assumption of a fixed  $M$  estimate. Despite the lack of scientific foundation around the fixed  $M$  assumption, the constant  $M$  approach is used in nearly all single species assessments conducted along the Atlantic coast. The wide acceptance of constant  $M$  occurs because time varying  $M$  is often difficult to estimate with confidence, and because a constant  $M$  assumption greatly reduces the number of parameters to be estimated in age structured VPA models. The constant  $M$  assumption implies that no systematic shifts in finfish mortality and productivity associated with predation, inter-specific competition and environmental effects are possible. Thus, the constant  $M$  assumption greatly limits our ability to explore for enhanced predation effects that may result in a systematic rise in  $M$  particularly among younger and smaller prey, as well as temporal shifts in environmental factors that can adversely affect recruitment, somatic growth and maturation. Since the choice of a fixed  $M$  value can greatly affect the magnitude of the  $F_{max}$  reference point, more detailed analyses are therefore required to determine whether or not  $M$  has change systematically over time due to enhanced predation and shifts in environmental variables. In future flounder stock assessments, the assumption that trophic and environmental effects are constant over time should be critically examined. The potential impacts of trophic and environmental effects on summer flounder should also be integrated into fisheries models and rigorously tested as a potential alternative hypothesis to the Overfishing Hypothesis.

The highly significant exponent ( $c$ ) for striped bass predation from the extended Ricker S-R and Gompertz models is consistent with the presence of enhanced density-independent mortality although, under certain conditions, enhanced finfish predation can give rise to compensatory or even depensatory density-dependent mortality (Tsou and Collie 2001). In any event, increased predation should result in a systematic rise in  $M$ , particularly for smaller flounder. This phenomenon plus the apparent emergence of a flounder recruitment bottleneck between ages 0 and 1 makes stock rebuilding of flounder via further management measures an exceedingly difficult task. As indicated by Spencer and Collie (1997), fish stocks that are subject to moderate to severe predatory mortality, often undergo a sudden and persistent drop or prolonged stagnation in recruitment and surplus production over time even when fishing mortality rates have remained low for several years. Note that biomass weighted fishing mortality ( $F_W$ ) on ages 1+ flounder reported here have been below my estimated  $F_{msy}$  threshold of 0.64 since 1995. If density-independent predation remains high, flounder recruitment and biomass may remain unresponsive to favorable climatic events and to further fishery management restrictions. The phenomenon of enhanced predation mortality could lead to a persistent stagnation in future flounder rebuilding unless predation pressure reverts back to pre 1998 levels.

There is a prevailing consensus that overfishing has had an adverse effect on many fish stocks throughout the world (Myers et al 1997; Hutchings and Reynolds 2004; Scheffer et al. 2001). However, the catch-at-age models traditionally used to estimate fishing mortality over time have almost always assumed a low and constant ( $M = 0.20$ ) natural mortality rate. Under the assumption of low and constant  $M$ , a rise in total mortality ( $Z$ ) over time is always construed as a rise in fishing mortality ( $F$ ). Thus in nearly all single species assessments, projection models always predict rapid stock rebuilding following sizeable reductions in  $F$ . But if the wide-spread assumption of constant  $M$  is violated and  $M$  actually rises systematically over time due to enhanced predatory mortality, the results from projection models of rapid stock rebuilding would

be highly misleading. Clearly there are finfish stocks throughout the world where natural mortality (M) approximates 0.20 for some period of time or can otherwise vary without trend. But as shown here for flounder and elsewhere for American shad (Savoy and Crecco 2004) and weakfish (Kahn et al 2005; Uphoff 2005), a systematic rise in predatory mortality on age 0 flounder coupled with relatively low and stable fishing mortality (F) can either greatly extend the timetable for rebuilding, or can simply eliminate the likelihood of any stock rebuilding even after the imposition of stringent conservation measures. A similar case study linking a rise in natural mortality to the lack of stock rebuilding has been recently addressed for Northern cod stocks (Shelton et al 2006). Several cod stocks on the Grand Banks have been under a landings moratorium since 1996, but stock rebuilding of these depleted stocks has, as of 2006, not been realized. Shelton et al (2006) reported that the lack of stock rebuilding of eight cod stocks was attributed to a recent rise in natural mortality from 0.2 prior to 1990 to 0.4 to 0.8 due mainly to enhanced gray seal (*Halichoerus grypus*) predation. In the case of summer flounder, the probability of successful stock rebuilding via management intervention is reduced further by the emergence of a recruitment bottleneck at age 0 as indicated by results from the extended Ricker S-R model. Due to recent increases in the minimum size on flounder, age 0 flounder are now only slightly susceptible to direct harvest, so a coast-wide moratorium would have little if any impact on the recently emergent recruitment bottleneck.

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Table 1 Flounder Ages 1+ mean stock size (NAV, millions) from ADAPT and predicted stock size (PREDNAV), ten trawl surveys and the recreational cpue in numbers (RelNt) from 1982-2006. Trawl survey indices include the federal spring (NMFSS), federal fall (NMFSF), federal winter (NMFSW), Massachusetts spring (MA), Connecticut Long Island Sound spring (CTS) and fall (CTF), Rhode Island fall (RIF) and fixed station (RIFIX), New Jersey (NJ) and Delaware (DE).

YEAR	nav	prednav	NMFSS	NMFSF	NMFSW	MA	CTS	CTF	RIF	RIFIX	NJ	DE	RelNt
1982	41.70	25.86	2.27	1.95		2.03			0.81				0.78
1983	42.20	37.20	0.95	1.94		2.12			0.68				1.21
1984	43.40	41.16	0.66	1.91		0.30	0.63	1.00	1.24				1.36
1985	31.80	22.95	2.38	1.33		1.41	0.44	1.19	0.61				0.67
1986	26.80	31.40	2.14	1.05		1.64	0.95	1.72	2.89				0.99
1987	33.90	28.76	0.93	0.83		1.22	1.06	1.40	1.22				0.89
1988	24.70	22.95	1.50	0.83		1.24	0.50	1.42	0.56		4.09		0.67
1989	9.50	8.45	0.32	0.26		0.43	0.10	0.14	0.07		0.69		0.12
1990	14.00	16.62	0.72	0.45		0.36	0.35	0.87	0.78	0.27	1.58	1.40	0.43
1991	18.30	22.69	1.08	0.94		0.09	0.64	1.26	0.23	0.15	2.98	1.35	0.66
1992	13.20	20.84	1.20	1.33	12.29	0.70	0.56	1.02	1.30	0.34	3.65	0.36	0.59
1993	21.20	31.13	1.27	0.84	13.60	0.68	0.51	1.11	0.72	0.25	5.91	2.36	0.98
1994	22.90	24.01	0.93	0.78	12.05	3.02	0.86	0.55	0.18	0.13	1.17	0.44	0.71
1995	24.00	23.22	1.09	1.47	10.93	1.38	0.28	0.54	0.73	0.05	3.42	1.47	0.68
1996	30.30	27.18	1.76	1.85	31.25	0.84	0.96	2.19	2.24	0.94	8.03	1.33	0.83
1997	28.70	25.33	1.06	2.76	10.28	2.01	1.00	2.50	1.80	0.69	14.70	1.24	0.76
1998	28.30	30.60	1.19	4.14	7.76	2.00	1.31	1.72	0.54	0.43	8.80	1.55	0.96
1999	32.50	32.19	1.60	3.58	11.06	2.26	1.44	2.68	3.10	0.87	10.41	1.49	1.02
2000	33.20	27.18	2.14	3.10	15.76	3.49	1.79	1.91	2.55	2.52	6.40	1.05	0.83
2001	38.40	29.29	2.69	2.88	18.59	2.09	1.75	4.42	2.14	0.97	5.06	2.30	0.91
2002	44.80	21.64	2.47	2.57	22.68	2.12	3.19	6.12	4.70	1.92	15.33	0.32	0.62
2003	51.00	23.48	2.91	2.80	35.62	2.41	3.42	3.39	5.47	3.73	9.24	0.58	0.69
2004	49.70	24.01	3.03	3.88	17.77	0.78	1.84	1.95	2.86	2.07	9.76	0.14	0.71
2005	55.30	27.70	1.81	2.59	12.89	2.02	0.80	2.41	3.29	2.46	8.08	0.43	0.85
2006	46.90	23.22	1.77	2.25	21.04	2.00	0.86	2.19	3.00			0.40	0.68

Table 2. Flounder ages 1+ stock biomass (BAV, mt\*1000) from ADAPT and predicted biomass (PREDBAV), five trawl surveys and the recreational cpue in kg/effort (RelWt) from 1982-2006 trawl survey indices include the federal spring (NMFSSK), federal fall (NMFSFK), federal winter (NMFSWK) and spring and fall CT (CTSK, CTFK),

<b>YEAR</b>	<b>bav</b>	<b>predbav</b>	<b>nmfssk</b>	<b>nmfsfk</b>	<b>nmfswk</b>	<b>ctsk</b>	<b>ctfk</b>	<b>RelWt</b>
1982	21.20	19.25	1.11	0.90				0.41
1983	25.00	21.93	0.53	0.47				0.65
1984	25.30	25.58	0.38	0.65				0.84
1985	20.80	19.47	1.20	0.87				0.40
1986	19.70	20.13	0.82	0.45				0.51
1987	20.60	21.65	0.38	0.28				0.67
1988	16.30	18.98	0.68	0.11				0.49
1989	7.67	7.10	0.24	0.08				0.07
1990	9.40	10.72	0.27	0.19				0.22
1991	10.00	11.11	0.35	0.17				0.22
1992	10.40	13.04	0.46	0.49	4.90	0.35	0.87	0.28
1993	12.40	14.99	0.48	0.04	5.50	0.27	0.85	0.36
1994	14.90	15.35	0.46	0.35	6.03	0.48	0.47	0.38
1995	18.20	15.58	0.46	0.83	4.81	0.16	0.43	0.39
1996	21.30	17.31	0.67	0.45	12.35	0.53	1.61	0.42
1997	21.00	18.63	0.61	0.92	5.54	0.60	1.84	0.49
1998	23.30	22.61	0.76	1.58	5.13	1.15	1.77	0.63
1999	22.50	24.77	1.01	1.66	7.99	1.09	2.27	0.67
2000	27.80	29.56	1.70	1.82	12.59	1.35	1.77	0.73
2001	33.40	33.91	2.16	1.55	15.68	1.21	3.19	0.82
2002	36.30	29.93	2.29	1.40	18.43	2.38	4.41	0.62
2003	44.80	30.58	2.42	1.93	27.48	2.45	3.27	0.62
2004	44.70	31.32	2.43	3.06	15.25	1.69	1.74	0.65
2005	45.70	32.48	1.59	1.83	10.32	0.67	1.93	0.88
2006	42.00	22.93	1.34		15.93	0.61	1.35	0.52

Table 3. Flounder recruitment (REC) from ADAPT, spawning stock biomass (SSB2, mt) and various environmental predictors, note that SSB2 from 1982-2000 from ADAPT and 2001-2006 from predicted model. Ages 7+ striped bass (STRIP) abundance from tagging (STRIP) and ages 8+ striper abundance from VPA.

<b>YRC</b>	<b>REC</b>	<b>SSB2</b>	<b>temp</b>	<b>nao</b>	<b>blue</b>	<b>STRIP</b>	<b>stripvpa</b>	<b>DGFISH</b>
1982	74300	22600.0	11.10	2.00	0.68		463	1.31
1983	80300	24400.0	12.00	0.74	0.69		333	3.33
1984	48400	21900.0	12.00	-0.38	0.48		245	0.92
1985	48600	19900.0	12.00	-0.03	0.52		232	0.35
1986	53400	18400.0	11.90	0.34	0.68		337	10.59
1987	43900	19100.0	11.80	0.10	0.78		412	5.58
1988	13000	10900.0	11.10	2.86	0.43	1770	495	5.74
1989	27300	7000.0	11.30	2.37	0.46	2830	628	10.19
1990	30400	9900.0	12.10	0.21	0.55	1996	1375	6.78
1991	28700	8700.0	12.60	1.68	0.38	1526	1918	14.21
1992	32300	9900.0	11.50	1.43	0.40	1715	2329	11.06
1993	33200	12300.0	11.70	1.80	0.27	2177	2621	8.94
1994	35300	15100.0	11.60	2.44	0.28	3728	3052	10.22
1995	38700	19000.0	12.50	-2.32	0.28	3308	3496	5.91
1996	28200	20000.0	10.60	0.18	0.26	4869	3865	3.40
1997	28900	20300.0	10.90	0.80	0.30	4397	4498	6.68
1998	31000	22000.0	12.10	0.98	0.24	3739	4372	6.72
1999	29200	22300.0	12.90	1.85	0.26	3921	4421	6.61
2000	33200	25400.0	12.20	-0.50	0.33	7454	4982	2.49
2001	33400	32945.4	12.50	0.79	0.38	9339	6934	18.14
2002	36600	29858.4	12.70	0.40	0.35	11371	7133	16.34
2003	27900	30625.4	11.50	-0.20	0.38	12168	7669	20.80
2004	38000	31262.5	11.70	-0.11	0.48	14727	8028	27.28
2005	17000	30738.6	11.80	-0.82	0.42	11865	6927	26.07
2006	30300	22326.4	13.00	1.83	0.39	12852	5915	33.76

Table 4. Pearson Correlation (r) Analyses between relative abundance (catch/tow) of each of the 11 candidate tuning indices and ages 1+ flounder abundance over the converged portion from ADAPT. This analysis was conducted on ages 1+ abundance over three converged time periods (1982-1998, 1982-1999, 1982-2000). An asterisk (\*) indicates a statistically significant ( $P < 0.05$ ) correlation between the ages 1+ tuning index and ages 1+ abundance.

Index	Time Periods (Years)					
	82-98		82-99		82-00	
	r	P	r	P	r	P
NMFSS	0.34	0.18	0.35	0.15	0.38	0.11
NMFSF	0.48	0.05*	0.48	0.04*	0.50	0.03*
NMFSW	0.31	0.49	0.20	0.63	0.23	0.56
MA	0.39	0.13	0.41	0.09	0.42	0.08
CTS	0.51	0.05*	0.54	0.03*	0.56	0.02*
CTF	0.46	0.09	0.50	0.05*	0.52	0.03*
RIF	0.24	0.35	0.27	0.27	0.31	0.20
RIFIX	0.58	0.10	0.68	0.03*	0.65	0.03*
NJ	0.72	0.01*	0.76	0.004*	0.72	0.005*
DE	0.25	0.52	0.28	0.44	0.19	0.58
RelNt	0.79	0.0001*	0.79	0.0001	0.79	0.0001*

Table 5. Pearson Correlation (r) Analyses between relative abundance (kg/effort) of each of the 6 candidate tuning indices and ages 1+ flounder biomass (mt) and SSB over the converged portion from ADAPT. This analysis was conducted on ages 1+ biomass and SSB over three converged time periods (1982-1998, 1982-1999, 1982-2000). An asterisk (\*) indicates a statistically significant ( $P < 0.05$ ) correlation between the ages 1+ tuning index and ages 1+ biomass and SSB.

Index	Time Periods (Years)							
	82-00		82-98		82-99		82-00	
	SSB				Biomass			
	R	P	r	P	r	P	r	P
NMFSSk	0.66	0.002*	0.51	0.04*	0.54	0.02	0.63	0.004*
NMFSFk	0.66	0.002*	0.63	0.007*	0.62	0.006*	0.69	0.001*
NMFSSWk	0.57	0.11	0.34	0.45	0.40	0.33	0.62	0.07
CTSk	0.85	0.004*	0.66	0.10	0.72	0.04*	0.82	0.007*
CTFk	0.82	0.007*	0.70	0.08	0.75	0.03*	0.73	0.02*
RelWt	0.82	0.0001*	0.88	0.0001*	0.88	0.0001*	0.89	0.0001*

Table 6. STEPWISE REGRESSION MODEL relating the 11 tuning indices to ages 1+ numbers, ages 1+ biomass and SSB for the three converged time periods (1982-1998, 1982-1999, 1982-2000). Flounder ages 1+ abundance, biomass and SSB from ADAPT were used as dependent variables. Independent variables selected by the stepwise model at the  $P < 0.05$  level were the recreational cpue in number (RelNt) and weight (RelWt) and the NEFSC spring index in kg/tow (NMFSSk). The parameter estimates (Est) and their standard error (SE) are give as well as the coefficient of determination ( $r^{**2}$ ).

Parameter	Time Periods (Years)							
	82-00		82-00		82-99		82-98	
	<b>SSB</b>				<b>Ages +Biomass</b>			
	<b>Est</b>	<b>SE</b>	<b>Est</b>	<b>SE</b>	<b>Est</b>	<b>SE</b>	<b>Est</b>	<b>SE</b>
Intercept	4.40	1.76	4.30	1.40	3.46	1.58	2.68	1.57
NMFSSk	5.90	1.93	4.94	1.54	6.32	1.96	7.28	1.96
RelWt	19.26	3.63	23.10	2.89	23.32	2.87	24.25	2.79
$r^{**2}$	0.79		0.88		0.88		0.88	
	<b>Ages 1+ numbers</b>							
Intercept			5.28	3.80	5.15	4.46	5.08	4.63
RelNt			26.28	4.66	27.58	5.30	27.72	5.58
$r^{**2}$			0.68		0.63		0.62	



Table 7. Combination of estimated and predicted ages 1+ abundance, coast-wide landings (#), catch weighted F ages 1+ biomass, landings biomass and biomass weighted F and surplus production, 1982-2006.

<b>YEAR</b>	<b>nav2</b>	<b>nav2l</b>	<b>catchn</b>	<b>FN2</b>	<b>bav2</b>	<b>bav2l</b>	<b>catchw</b>	<b>Fw2</b>	<b>surpbb</b>
1982	41741.99	42186.33	31100	0.7411	21200.0	25000.0	18960	0.8208	22760.0
1983	42186.33	43434.67	42600	0.9951	25000.0	25300.0	26500	1.0537	26800.0
1984	43434.67	31760.21	46200	1.2288	25300.0	20800.0	26100	1.1323	21600.0
1985	31760.21	26774.55	35300	1.2061	20800.0	19700.0	20400	1.0074	19300.0
1986	26774.55	33900.41	32500	1.0713	19700.0	20600.0	20900	1.0372	21800.0
1987	33900.41	24732.20	30200	1.0301	20600.0	16300.0	18300	0.9919	14000.0
1988	24732.20	9517.85	38000	2.2190	16300.0	7600.0	21800	1.8243	13100.0
1989	9517.85	14033.94	14300	1.2144	7600.0	9400.0	10300	1.2118	12100.0
1990	14033.94	18316.34	12200	0.7542	9400.0	10000.0	8000	0.8247	8600.0
1991	18316.34	13185.28	20100	1.2761	10000.0	10400.0	11300	1.1078	11700.0
1992	13185.28	21166.18	18600	1.0829	10400.0	12400.0	11800	1.0351	13800.0
1993	21166.18	22903.52	17600	0.7987	12400.0	14900.0	10800	0.7912	13300.0
1994	22903.52	23991.90	18700	0.7975	14900.0	18200.0	12200	0.7372	15500.0
1995	23991.90	30334.12	14800	0.5449	18200.0	21300.0	10500	0.5317	13600.0
1996	30334.12	28649.71	18500	0.6273	21300.0	21000.0	11600	0.5485	11300.0
1997	28649.71	28259.64	14500	0.5096	21000.0	23300.0	10300	0.4650	12600.0
1998	28259.64	32531.04	15000	0.4935	23300.0	22500.0	11600	0.5066	10800.0
1999	32531.04	33174.50	14100	0.4292	22500.0	27800.0	10900	0.4334	16200.0
2000	33174.50	29285.80	15700	0.5027	27800.0	33912.4	13800	0.4472	19912.4
2001	29285.80	21635.60	13200	0.5185	33912.4	29934.6	11900	0.3728	7922.2
2002	21635.60	23482.20	12200	0.5408	29934.6	30576.8	11300	0.3735	11942.2
2003	23482.20	24009.80	13000	0.5475	30576.8	31319.2	12900	0.4168	13642.4
2004	24009.80	27703.00	14300	0.5531	31319.2	32482.6	13800	0.4326	14963.4
2005	27703.00	23218.40	13900	0.5459	32482.6	22931.6	13400	0.4836	3849.0
2006	23218.40	23218.00	12635	0.5442	22931.6	22932.0	12300	0.5364	12300.4

Table 8. Parameter estimates (a, b, c) for summer flounder derived from the Gompertz external production model with and without striped bass predation. The overfishing thresholds ( $F_{msy}$ ,  $B_{msy}$ ) were derived from the Gompertz model with striped bass effects. The models were fitted to the LTS Robust regression model. The standard error (SE) is given for each parameter estimate (a, b, Strip), as well as the coefficient of determination ( $r^2$ ). Overfishing thresholds ( $F_{msy}$ ,  $B_{msy}$ ) are presented with 80% CI.

**LTS Robust Regression Model Without Striped Bass**

<b>Parameter</b>	<b>Mean</b>	<b>SE</b>	<b>P</b>
a	8.05	1.08	< 0.0001
b	-0.74	0.11	< 0.0001
$r^2$	0.80		

**LTS Robust Regression With Striped Bass Effects**

<b>Parameter</b>	<b>Mean</b>	<b>SE</b>	<b>P</b>
a	7.29	1.01	< 0.0001
b	-0.64	0.10	< 0.0001
c**	-1.36	0.34	<0.0001
$r^2$	0.83		

<b>Threshold</b>	<b>Mean</b>	<b>80% Confidence Limit</b>
$F_{msy}$	0.64	0.51 – 0.77
Fcoll	1.74	1.39 – 2.09
$B_{msy}$	32,500 mt	29,900 – 39,200 mt

\*\* c is the slope estimate for striped bass effects

TABLE 9. Stepwise model relating the abundance of three candidate predators (bluefish, striped bass and spiny dogfish) and two environmental variables (t and t-1 lagged mean annual water temperature and deviations in the winter NAO) to surplus production from the Gompertz Production model. The stepwise model selected striped bass abundance (SCAM based) as the only significant ( $P < 0.02$ ) explanatory variable. The standard error (SE) is given for each parameter estimate (a, b, c), as well as the coefficient of determination ( $r^2$ ).

**Least Squares Fit**

<b>Parameter</b>	<b>Mean</b>	<b>SE</b>	<b>P</b>
a	7.84	1.20	< 0.0001
b	-0.70	0.12	< 0.0001
c**	-1.04	0.42	< 0.02
$r^2$	0.85		

\*\* c is the slope estimate for striped bass effects

Table 10. Shepherd S-R Parameter estimates (A, Kp, c) for summer flounder with and without striped bass predation. The S-R models were fitted by nonlinear iterative re-weighted least squares regression. The shape parameter (b) was fixed at 1.0 for the Beverton-Holt model and at 2.0 for the dome-shaped Ricker model. The approximate standard error (SE) is given for each parameter estimate (a, Kp, Strip), as well as the coefficient of determination ( $r^2$ ).

Parameter	Beverton-Holt			Ricker		
	Mean	SE	P	Mean	SE	P
A	23.65	15.45	<0.34	4.16	0.51	<0.0001
Kp	1488.3	1056.5	< 0.47	17532.0	1903.3	< 0.0001
$r^2$	0.85			0.81		

**Ricker S-R With Striped Bass Effects**

Parameter	Mean	SE	P
a	4.46	0.31	< 0.0001
Kp	22171.6	1948.5	< 0.0001
c **	-0.000092	0.000012	<0.0001
$r^2$	0.91		

\*\* c is the exponent for striped bass effects

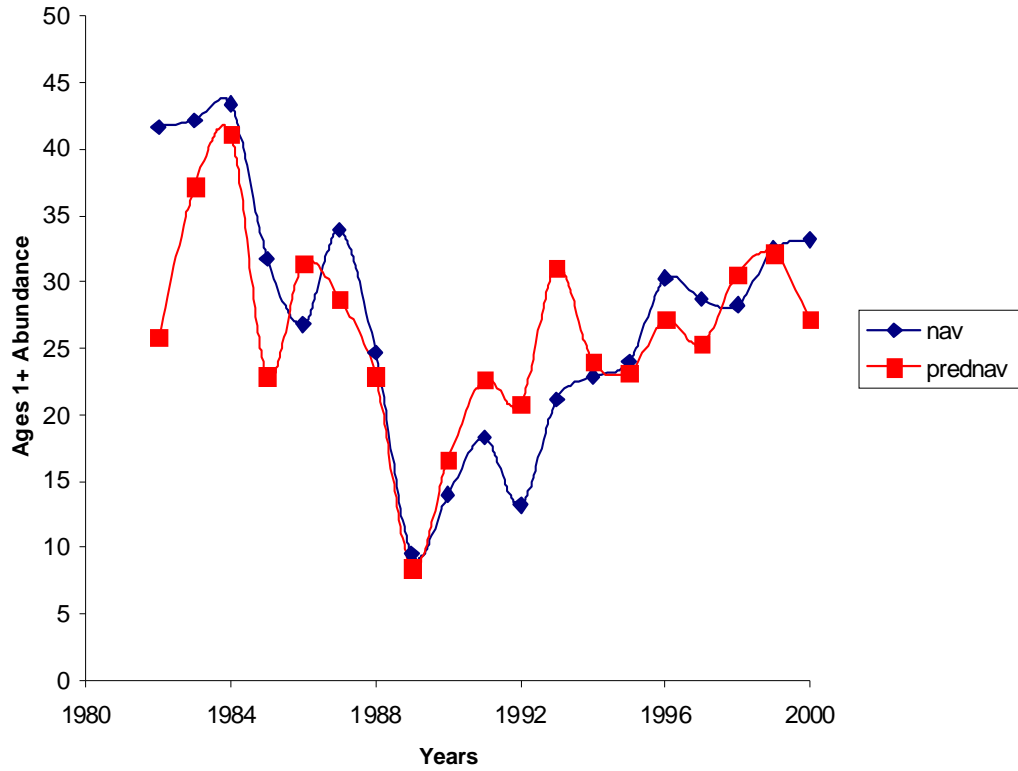


Figure 1. Plot of estimated and predicted ages 1+ flounder numbers over the converged portion (1982-2000) of ADAPT.

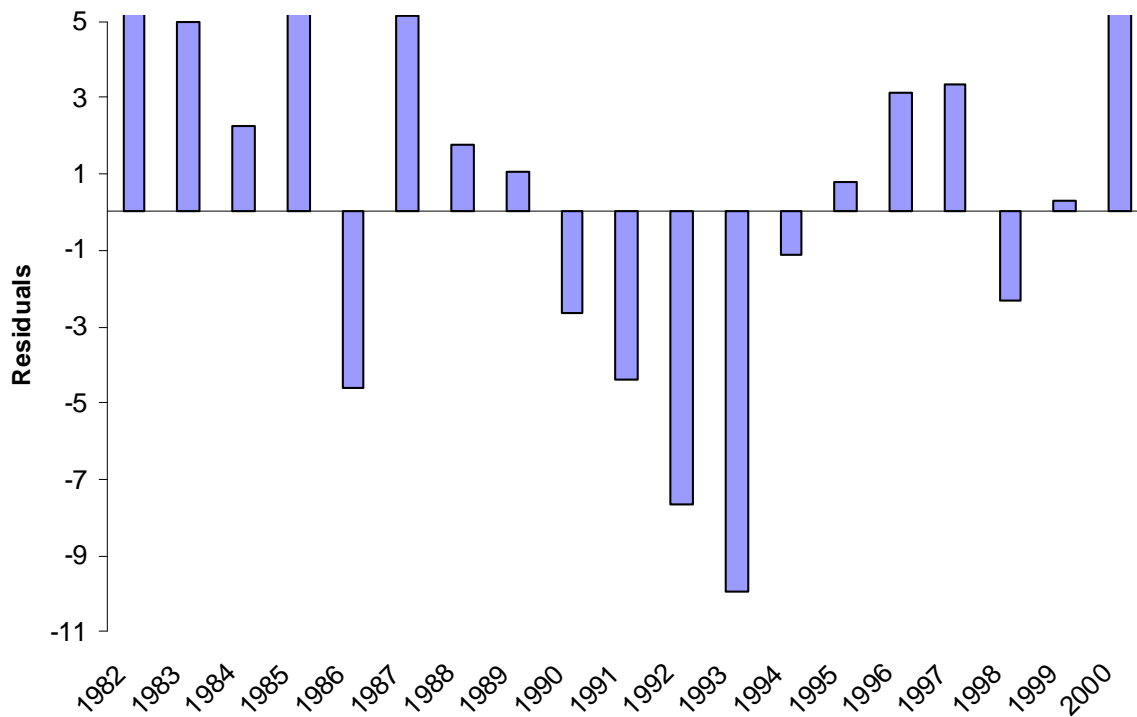


Figure 2. Residual plot for estimated and predicted ages 1+ numbers over time 1982-2000.

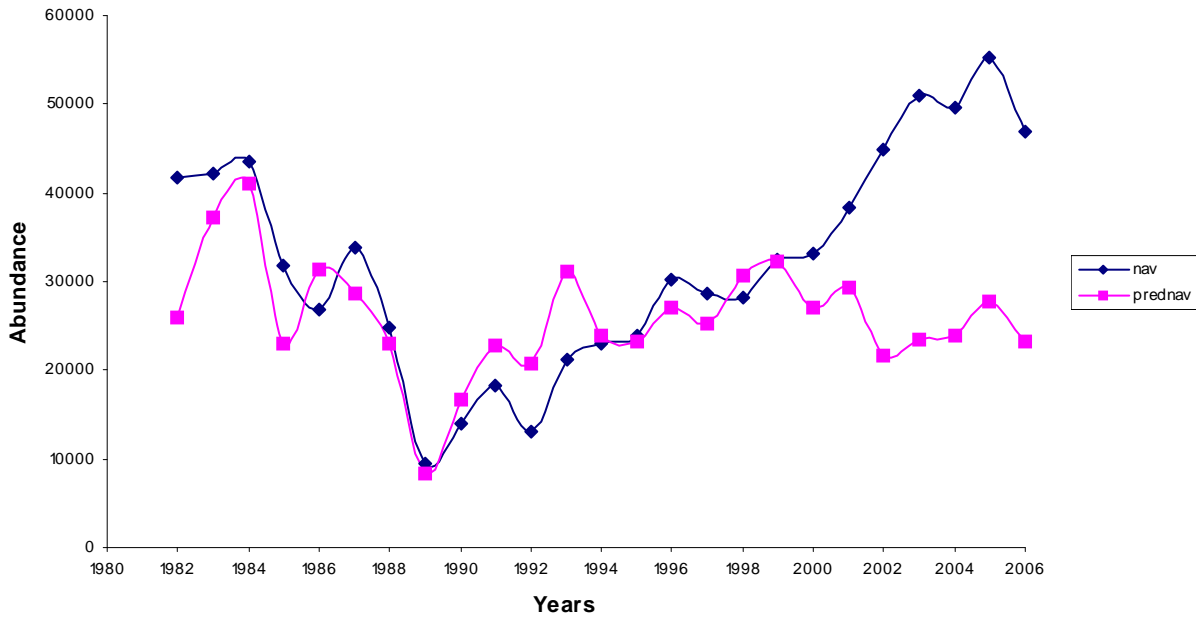


Figure 3. Estimated and predicted ages 1+ flounder abundance, 1982-2006.

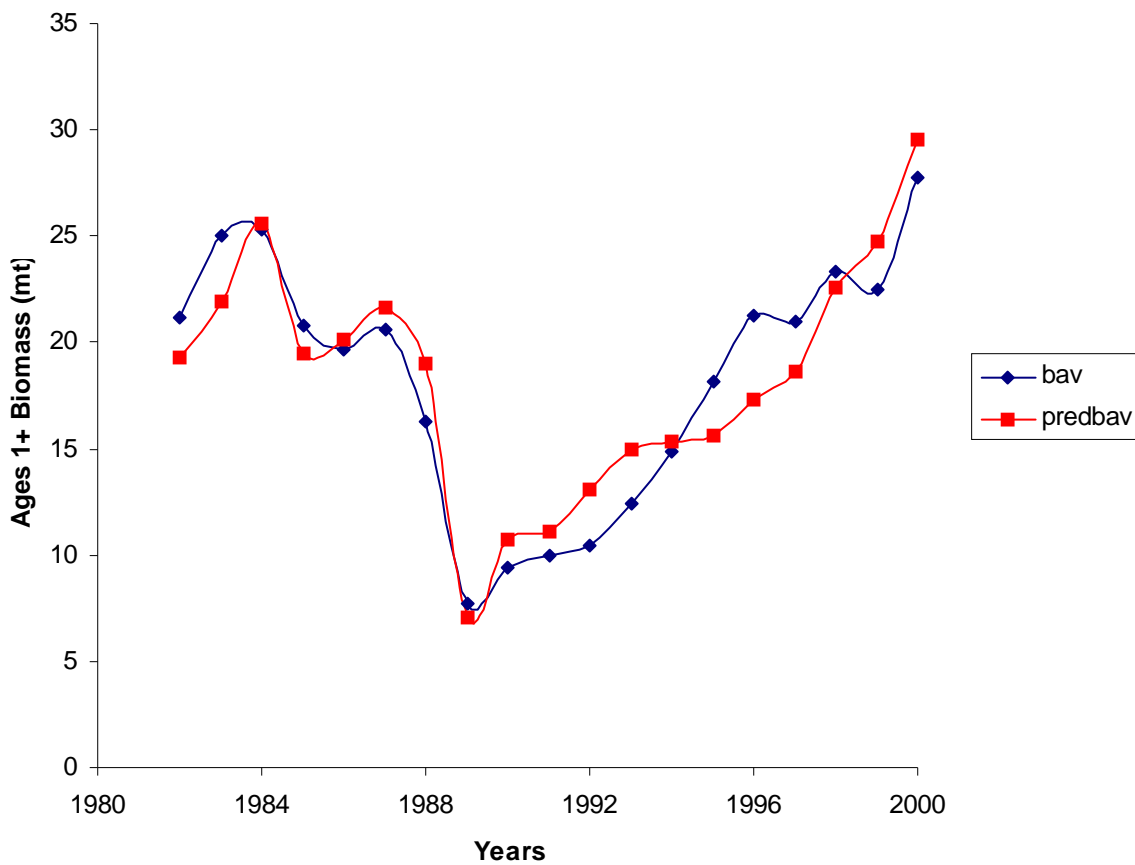


Figure 4. Plot of Estimate and predicted ages 1+ flounder biomass over the converged portion (1982-2000) of ADAPT.

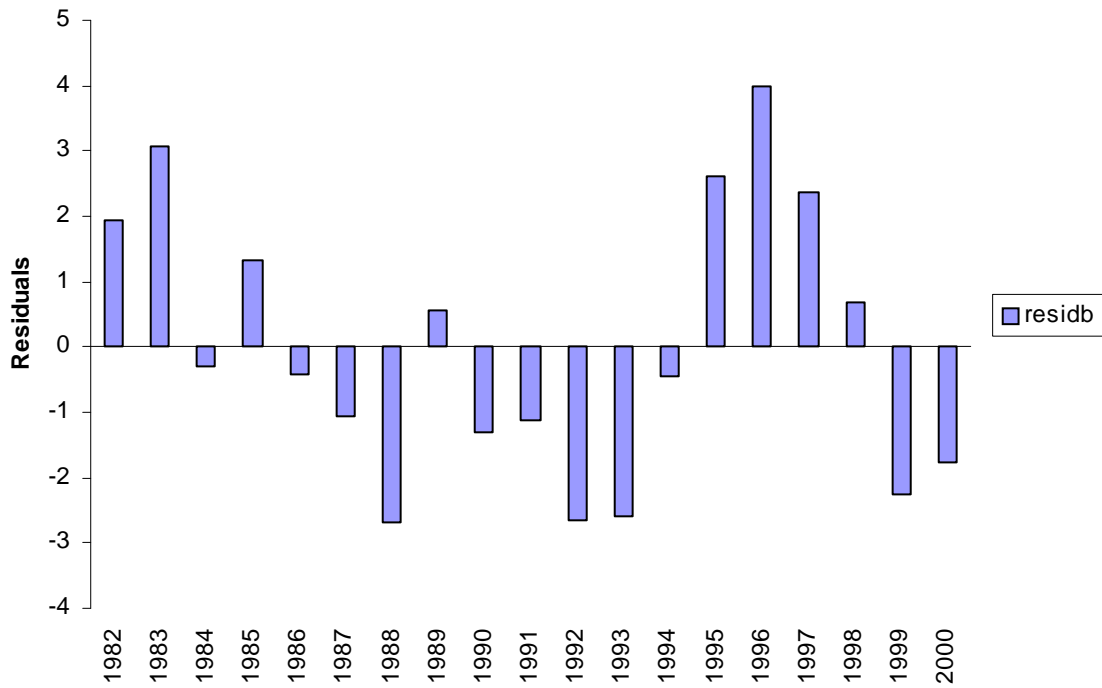


Figure 5. Residual plot for estimated and predicted ages 1+ biomass over time 1982-2000.

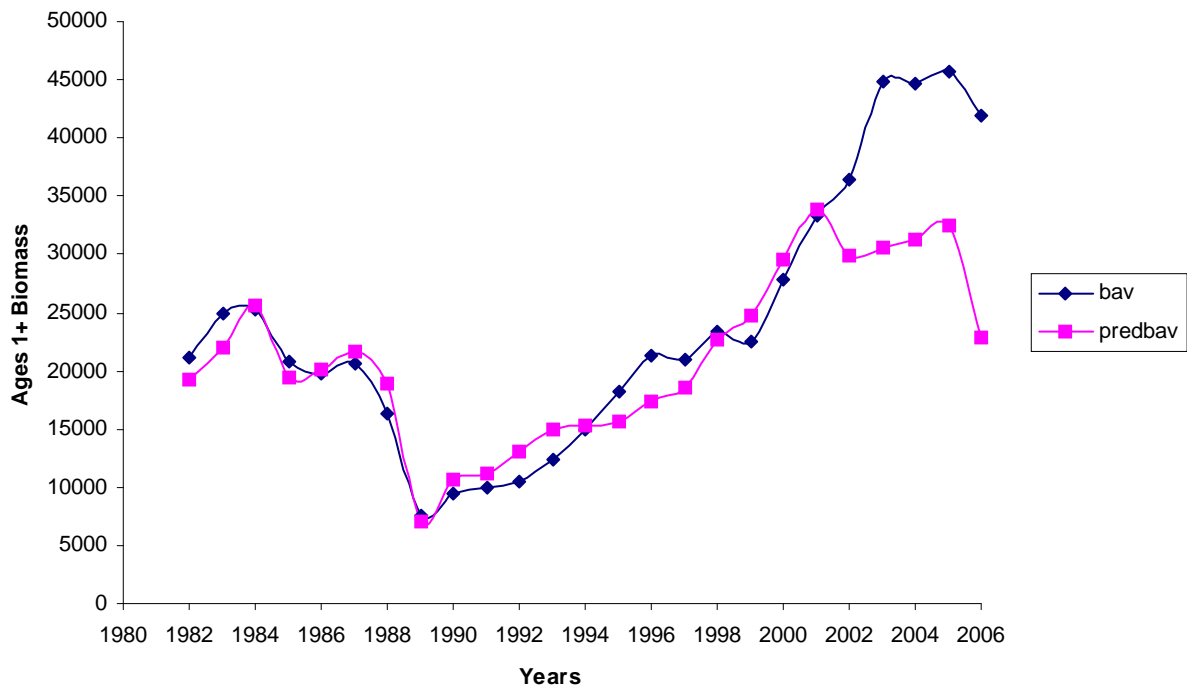


Figure 6. Estimated and predicted ages 1+ flounder biomass, 1982-2006.

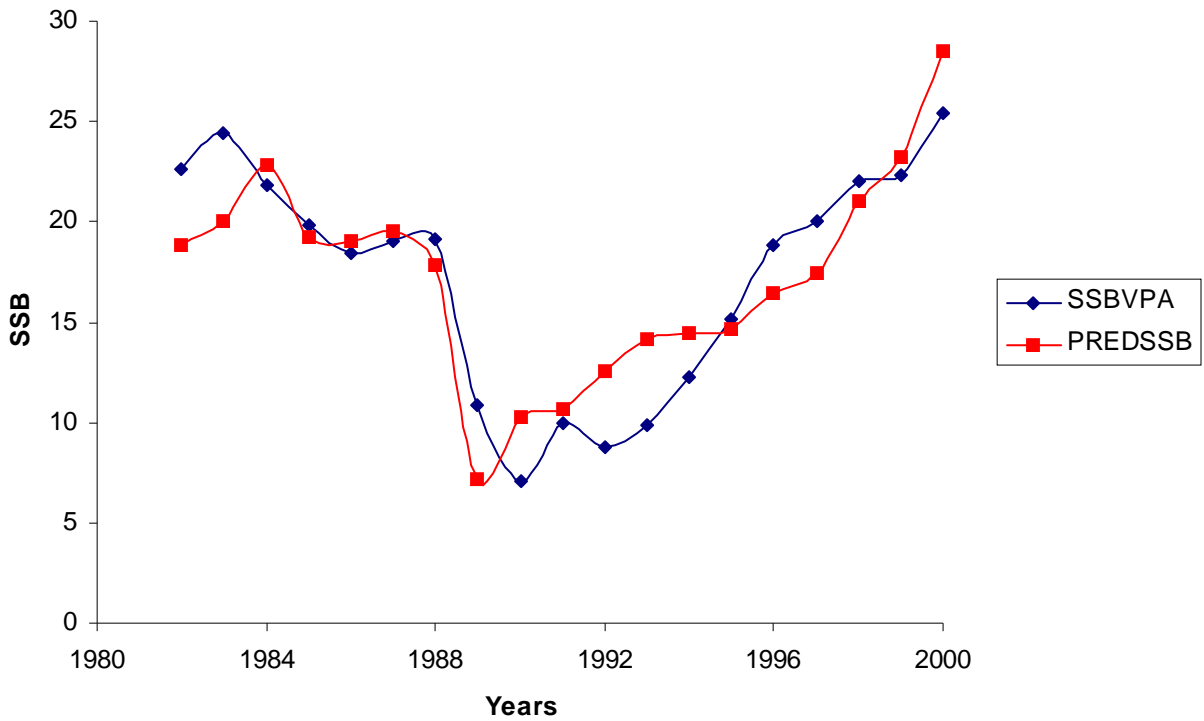


Figure 7. Plot of estimated and predicted ages 1+ flounder ssb over the converged portion (1982-2000) of ADAPT

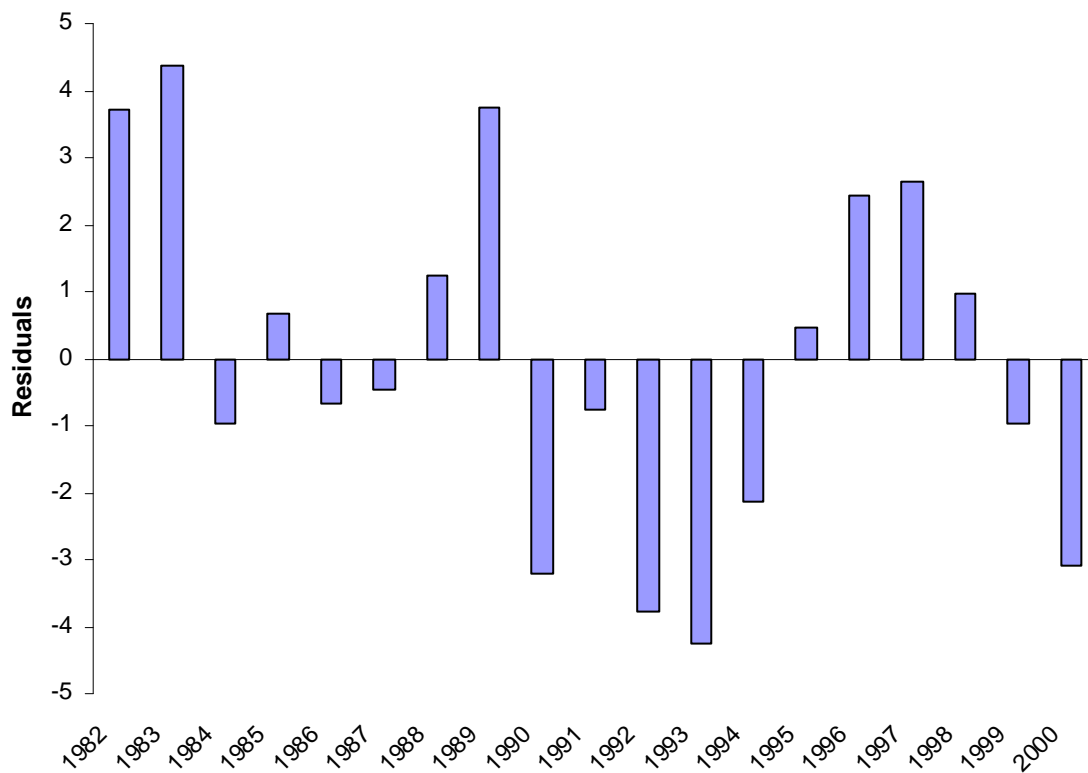


Figure 8. Residual plot for estimated and predicted SSB over time 1982-2000.



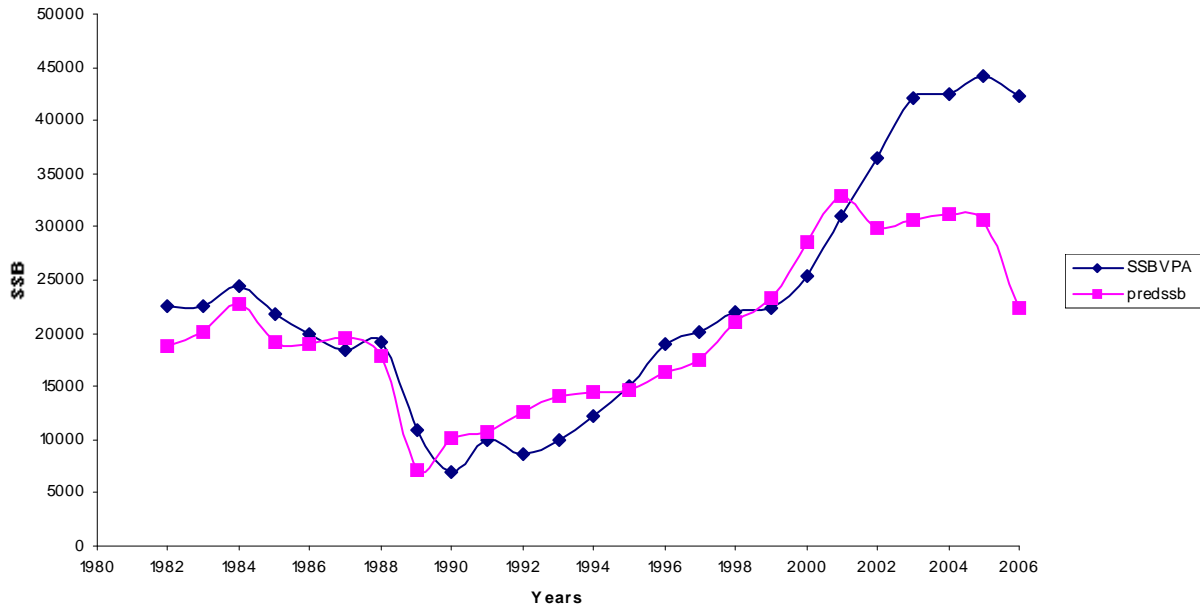


Figure 9. Estimated and predicted flounder SSB, 1982-2006.

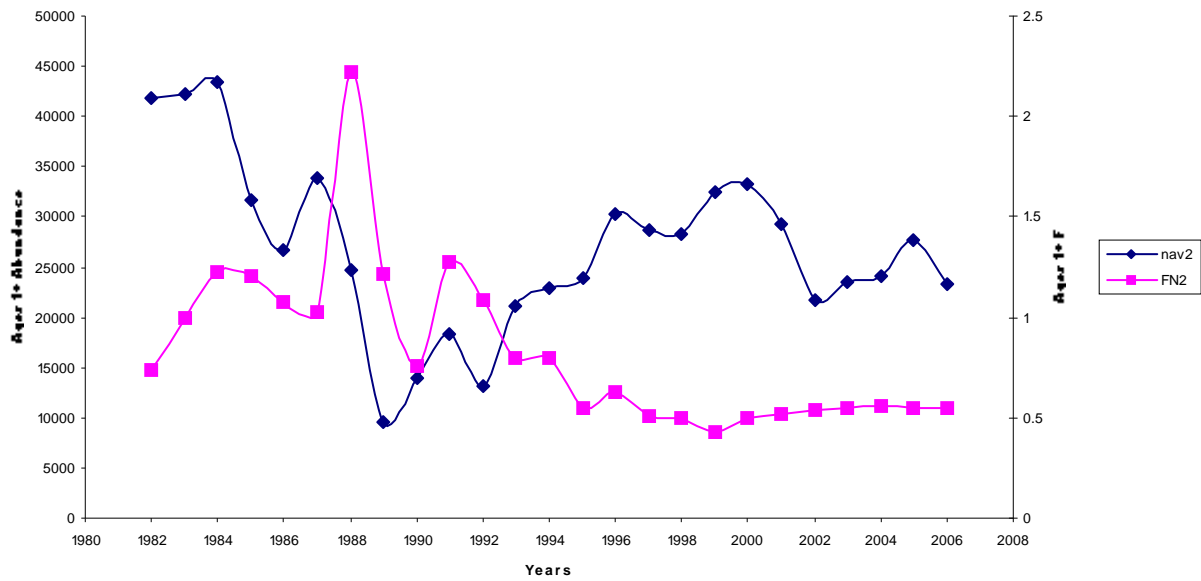


Figure 10. Relationship between ages 1+ fishing mortality and ages 1+ abundance, 1982-2006.

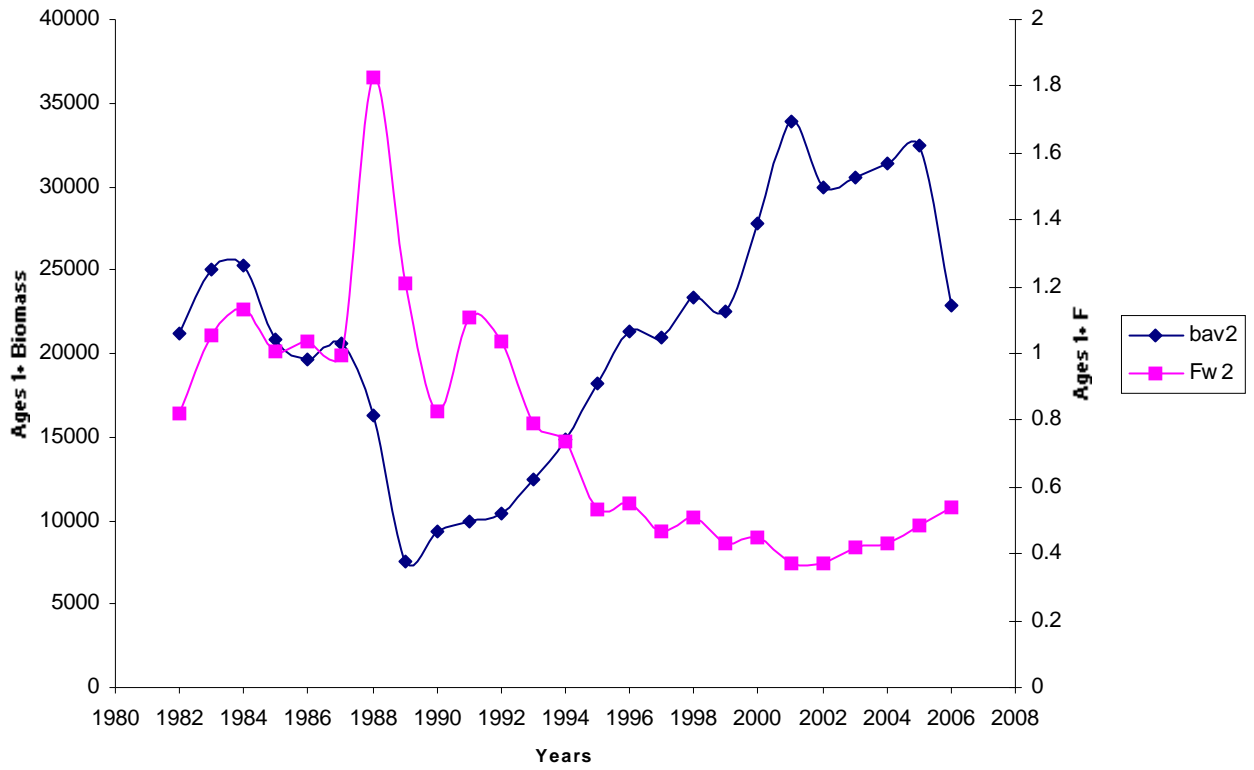


Figure 11. Relationship between biomass weighted F and ages 1+ flounder biomass 1982-2006.

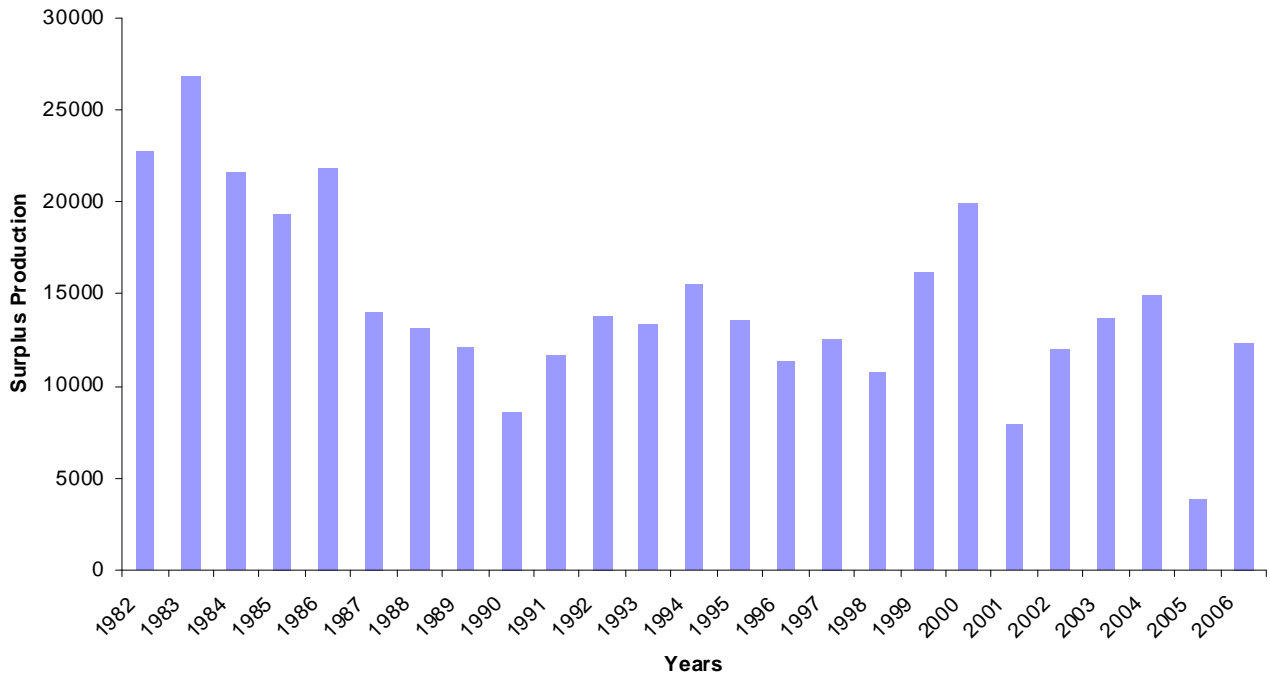


Figure 12. Plot of flounder surplus production, 1982-2006.

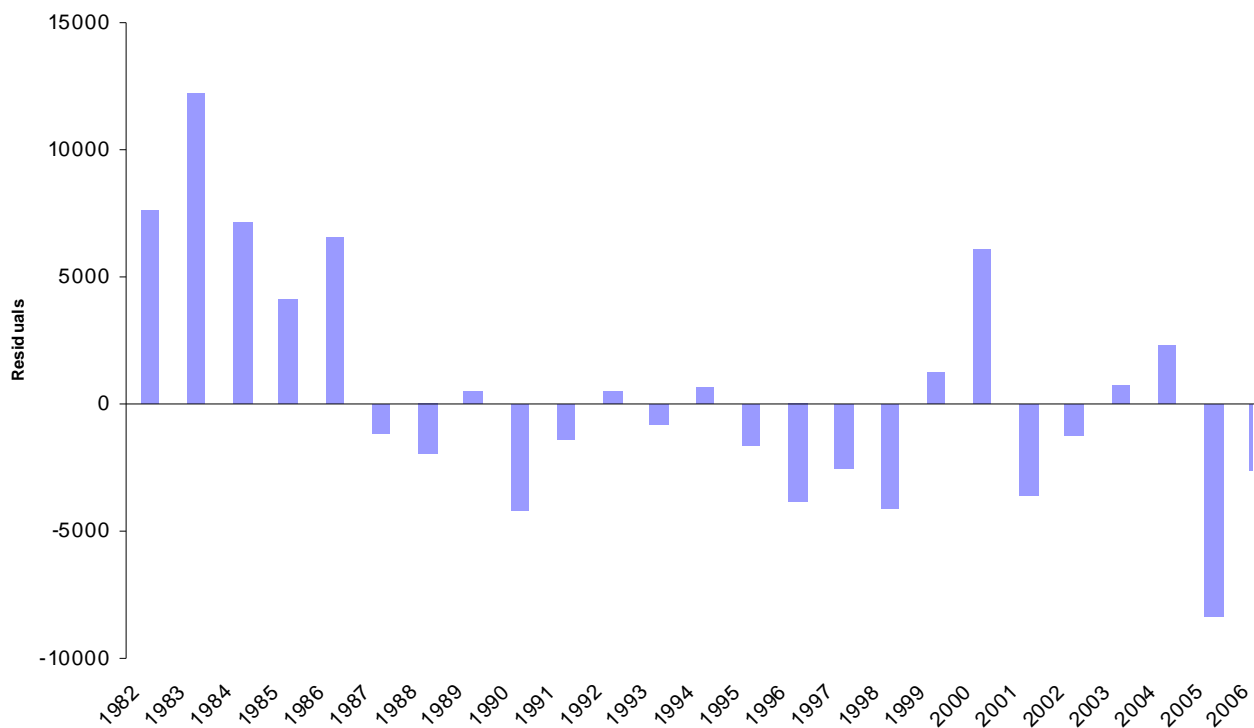


Figure 13. Residual plot for Gompertz Surplus Production Model for flounder without predation, 1982-2006.

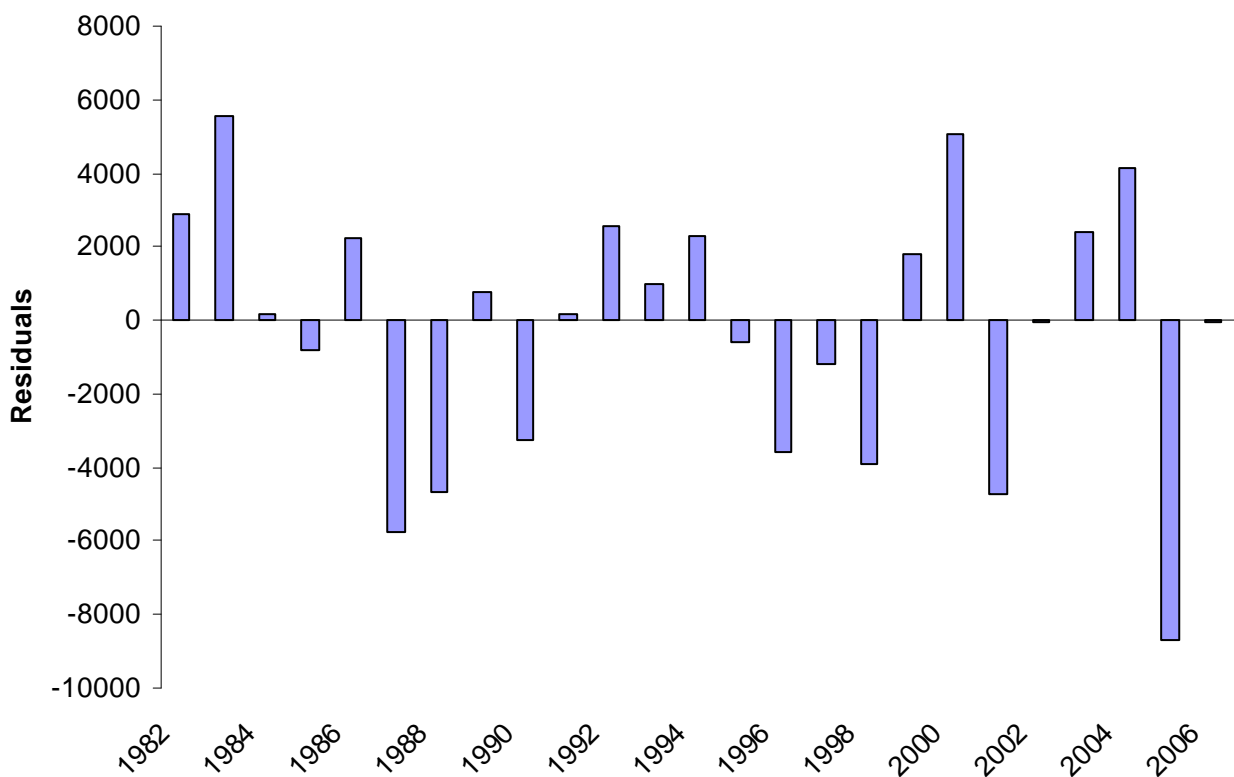


Figure 14. Residual plot from Gompertz model for flounder with striper predation effects, 1982-2006

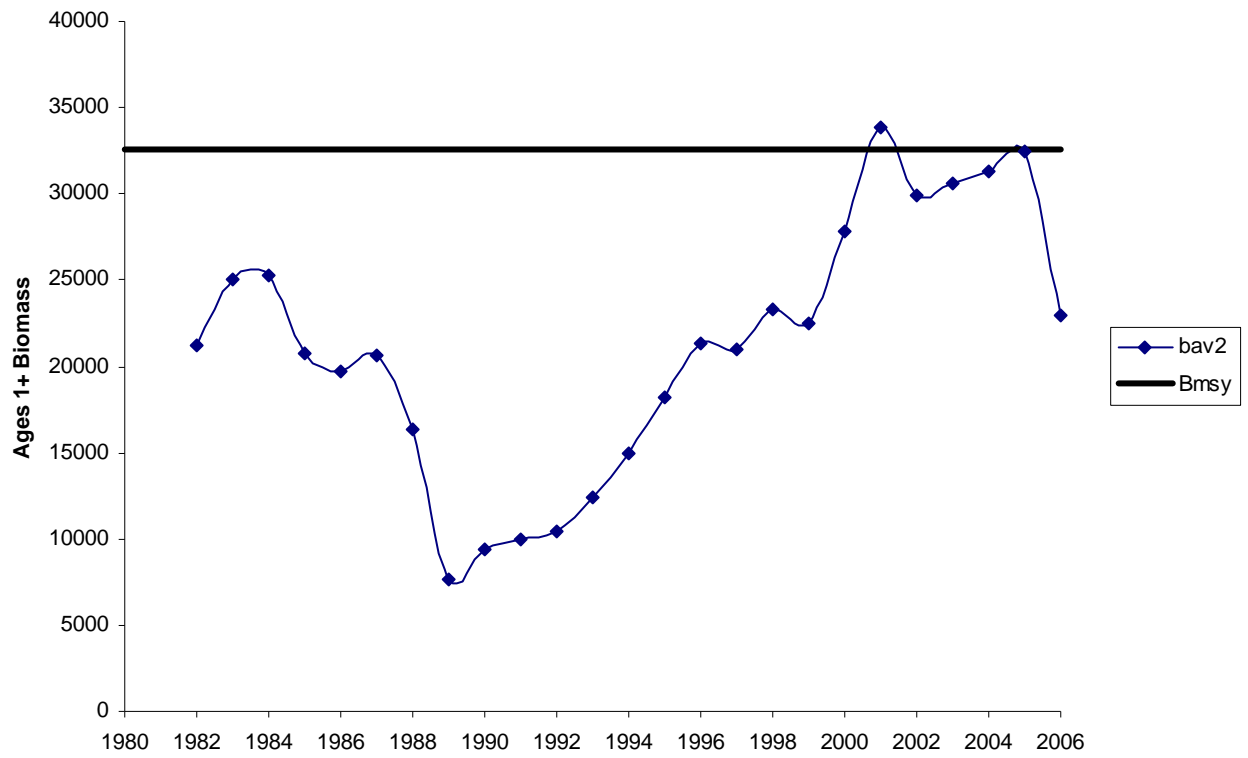


Figure 15. Plot of ages 1+ biomass and Bmsy from Gompertz model with predation 1982-2006.

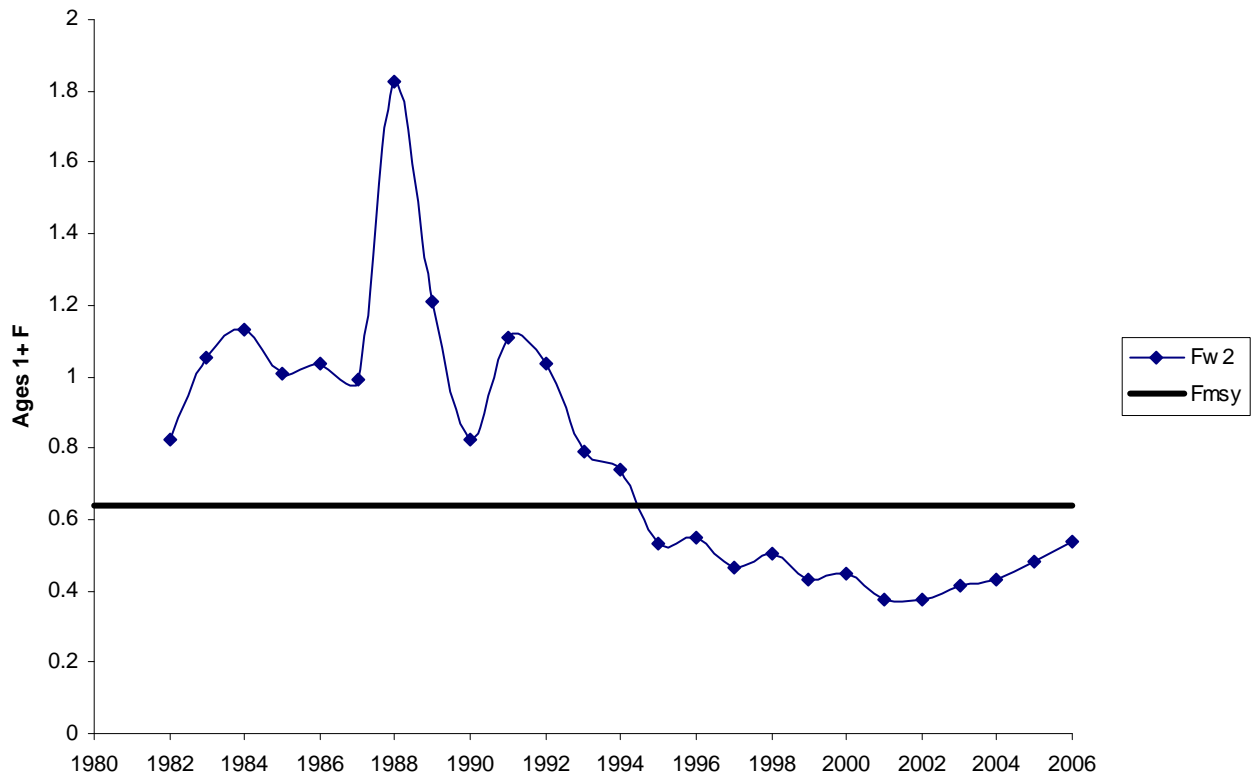


Figure 16. Plot of ages 1+ biomass weighted F and Fmsy from Gompertz model with predation, 1982-2006.

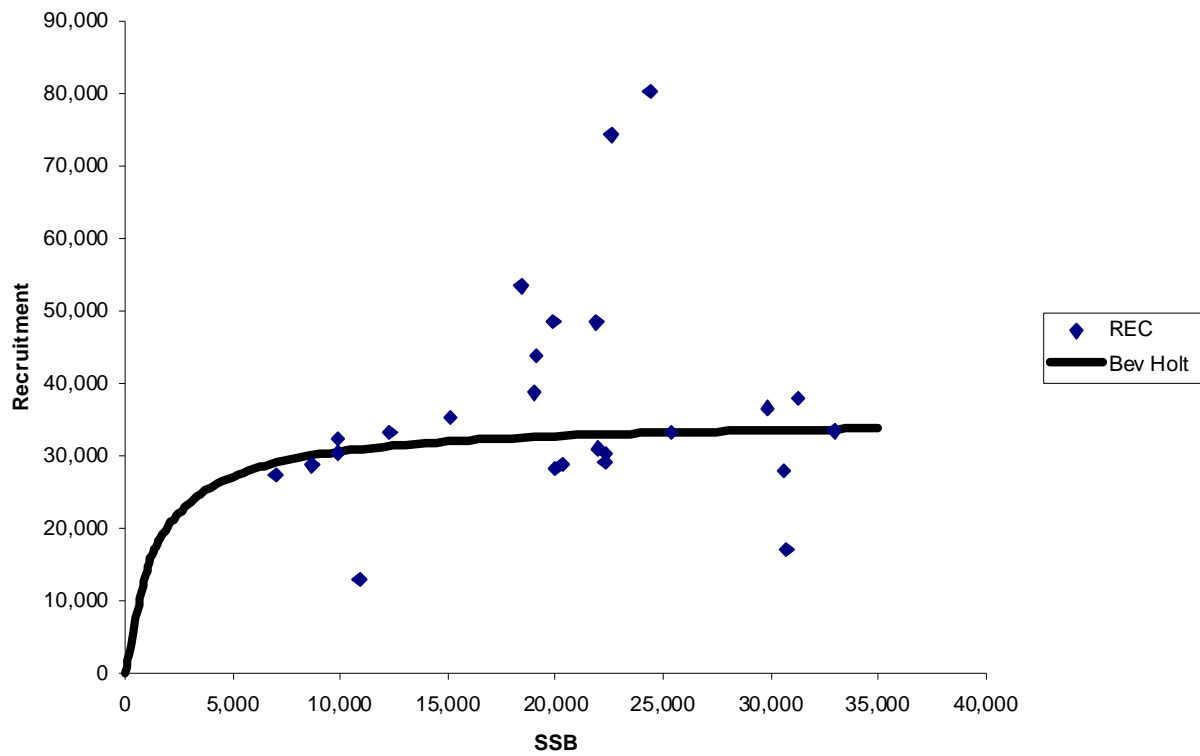


Figure 17. Stock-Recruitment fit to the Beverton-Holt model, 1982-2006.

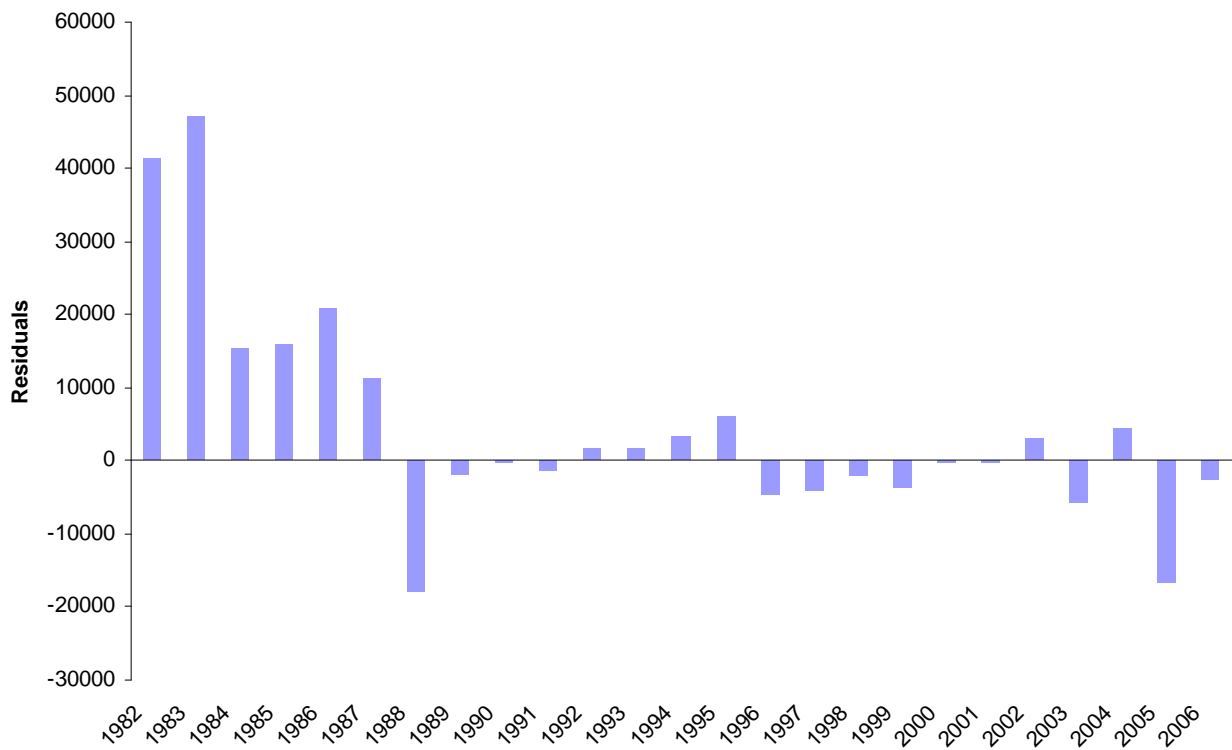


Figure 18. Plot of residuals for Beverton-Holt Model, 1982-2006

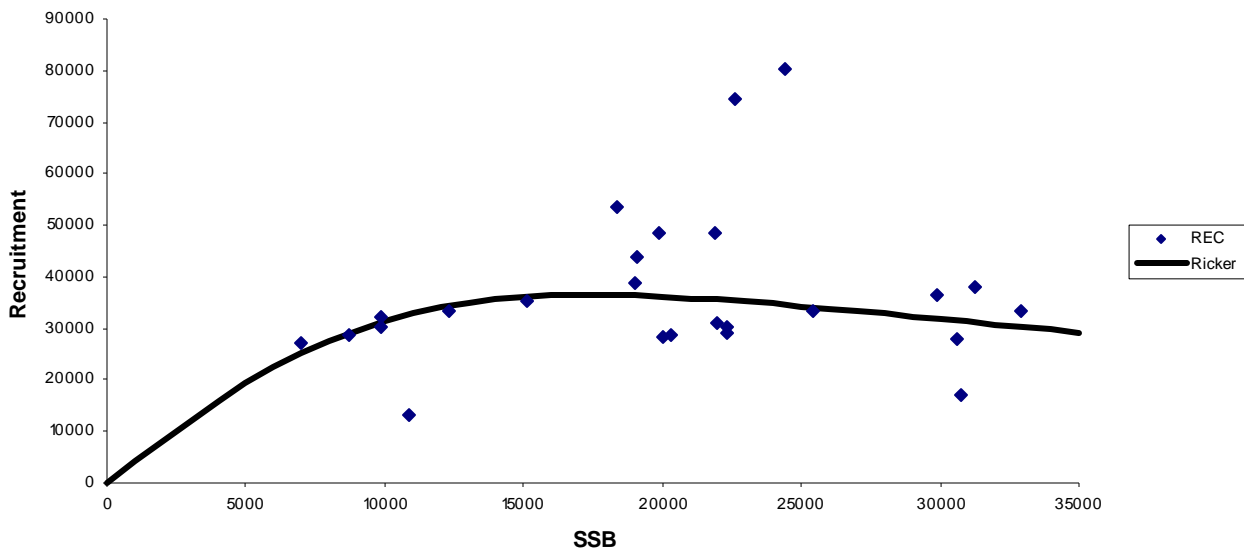


Figure 19. Stock-recruitment fit to the Ricker S-R model, 1982-2006.

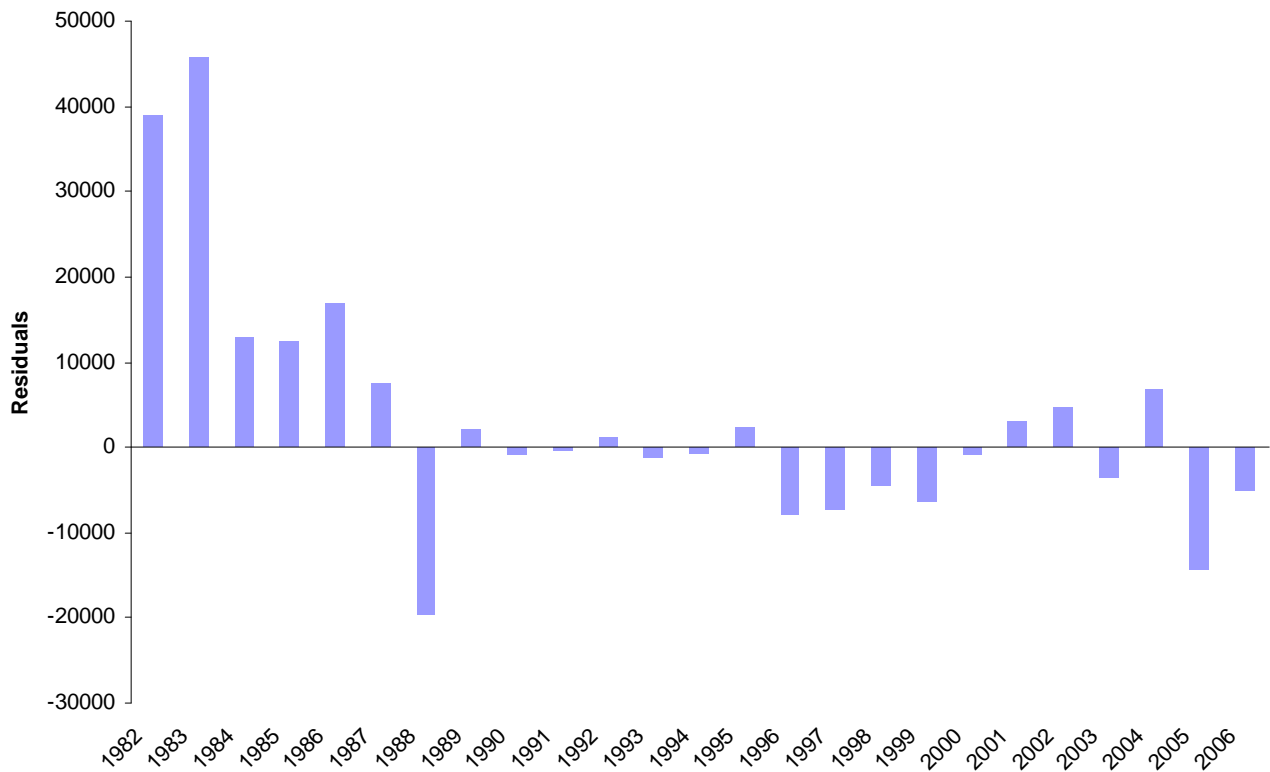


Figure 20. Plot of residuals for the Ricker Type Model, 1982-2006.

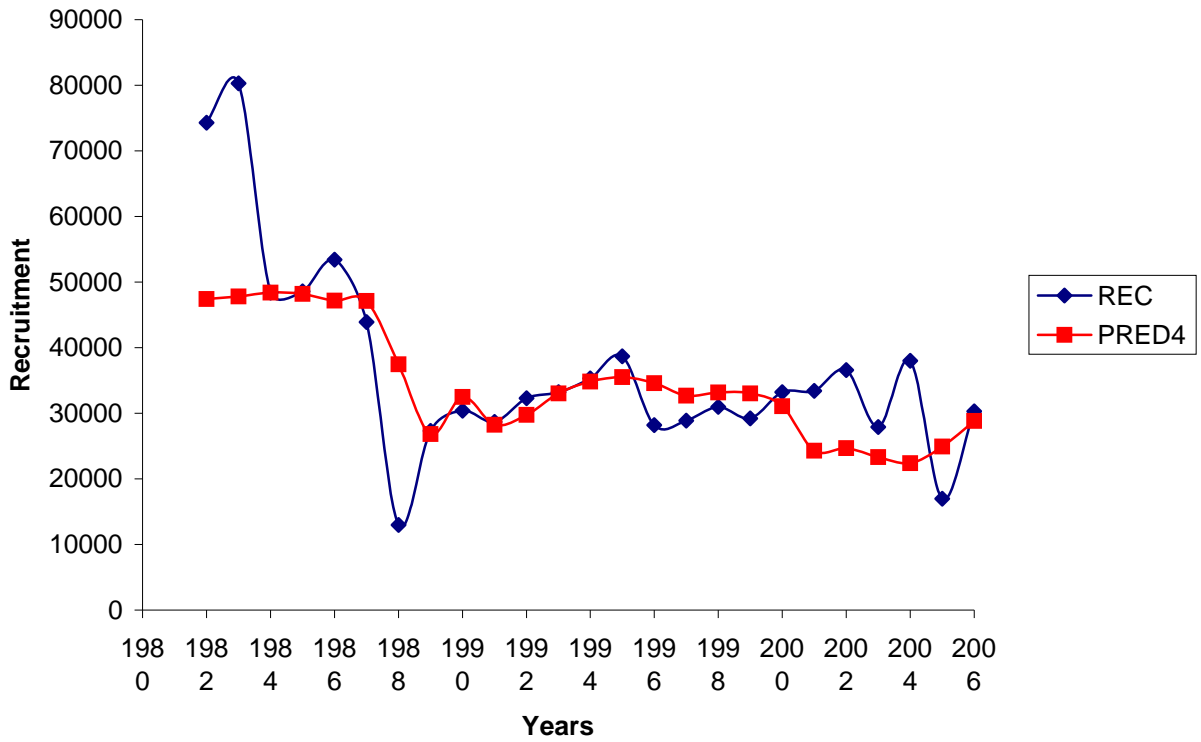


Figure 21. Observed and predicted recruitment from the Ricker Type Model with striped bass predation, 1982-2006.

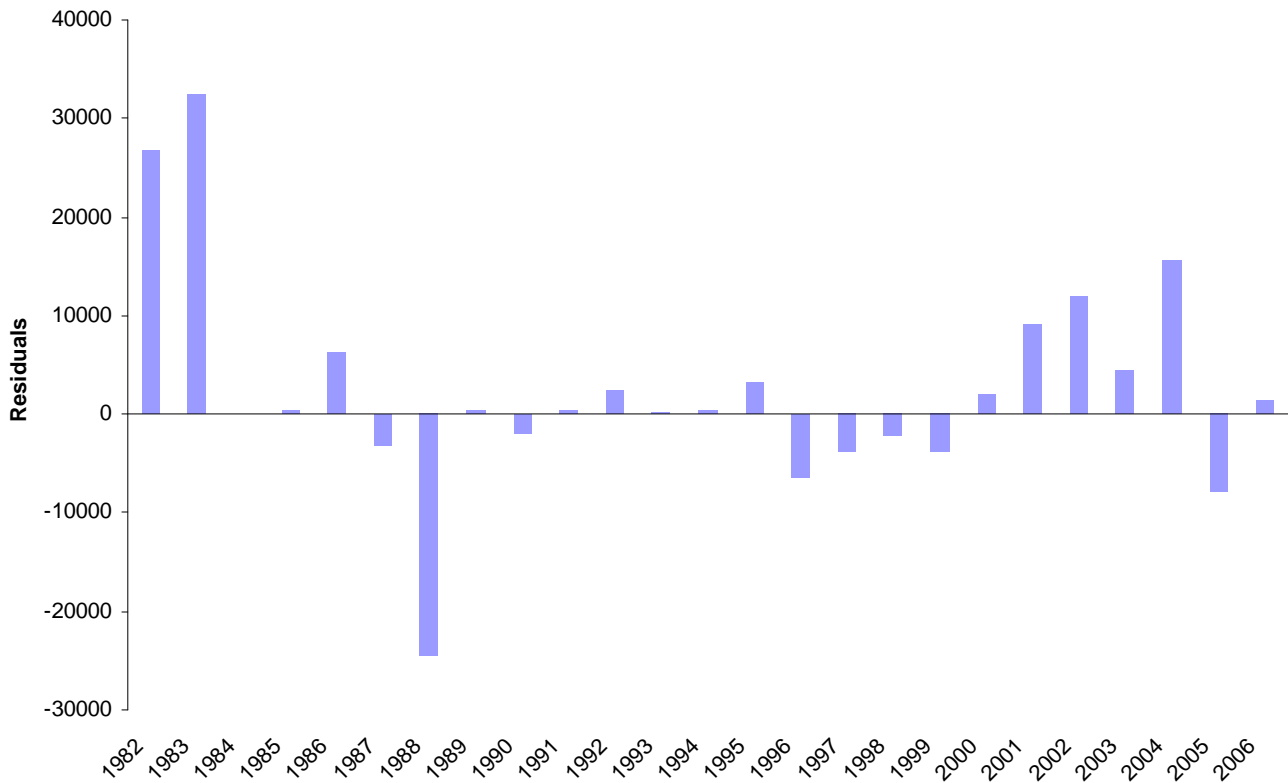


Figure 22. Plot of residuals from the Ricker Type Model with striped bass predation, 1982-2006.

**ADAPT VPA BASE RUN (F08 BASE .OUT)**

VPA Version 2.7.1

Model ID: Summer flounder: agreed BASE configuration

Input File: C:\F2008\ADAPT\F08\_BASE\_00.DAT

Date of Run: 19-FEB-2008

Time of Run: 08:54

Levenburg-Marquardt Algorithm Completed      5 Iterations  
Residual Sum of Squares =      422.904

Number of Residuals      =      823  
Number of Parameters      =      6  
Degrees of Freedom      =      817  
Mean Squared Residual      =      0.517630  
Standard Deviation      =      0.719465

Number of Years =      25  
Number of Ages =      8  
First Year      =      1982  
Youngest Age      =      0  
Oldest True Age =      6

Number of Survey Indices Available      =      51  
Number of Survey Indices Used in Estimate =      39

VPA Classic Method - Auto Estimated Q's

Stock Numbers Predicted in Terminal Year Plus One (2007)

Age	Stock Predicted	Std. Error	CV
1	25416.986	0.629488E+04	0.247664E+00
2	10309.217	0.211378E+04	0.205038E+00
3	17336.856	0.313950E+04	0.181088E+00
4	5396.882	0.107440E+04	0.199078E+00
5	4052.447	0.975869E+03	0.240810E+00
6	1050.270	0.596189E+03	0.567654E+00

Catchability Values for Each Survey Used in Estimate

INDEX	Catchability	Std. Error	CV
1	0.141956E-03	0.269635E-04	0.189943E+00
2	0.416467E-03	0.456733E-04	0.109668E+00
3	0.341157E-03	0.456260E-04	0.133739E+00
4	0.337567E-03	0.675095E-04	0.199988E+00
5	0.447993E-03	0.742654E-04	0.165774E+00
6	0.138176E-04	0.196560E-05	0.142253E+00
7	0.379163E-04	0.379567E-05	0.100107E+00
8	0.344239E-04	0.555454E-05	0.161357E+00
9	0.383975E-04	0.476407E-05	0.124072E+00



10	0.652723E-04	0.813949E-05	0.124700E+00
11	0.676126E-04	0.443512E-05	0.655960E-01
12	0.811036E-04	0.103929E-04	0.128143E+00
13	0.756270E-04	0.106850E-04	0.141286E+00
15	0.406577E-04	0.766483E-05	0.188521E+00
16	0.432367E-04	0.710121E-05	0.164240E+00
18	0.168215E-03	0.178525E-04	0.106129E+00
19	0.657295E-04	0.129519E-04	0.197048E+00
21	0.173459E-04	0.278618E-05	0.160625E+00
22	0.184656E-04	0.284132E-05	0.153871E+00
23	0.295921E-04	0.560622E-05	0.189450E+00
24	0.425758E-04	0.678960E-05	0.159471E+00
25	0.107830E-03	0.138240E-04	0.128201E+00
26	0.882136E-04	0.121995E-04	0.138295E+00
27	0.606059E-04	0.105664E-04	0.174347E+00
29	0.111458E-03	0.169981E-04	0.152506E+00
30	0.854502E-04	0.180487E-04	0.211218E+00
31	0.104477E-04	0.217262E-05	0.207952E+00
32	0.209505E-04	0.353428E-05	0.168696E+00
33	0.158198E-03	0.236253E-04	0.149340E+00
34	0.688016E-04	0.153953E-04	0.223764E+00
35	0.436851E-04	0.803555E-05	0.183943E+00
36	0.588380E-04	0.101782E-04	0.172986E+00
40	0.184557E-05	0.398576E-06	0.215963E+00
41	0.281985E-04	0.321951E-05	0.114173E+00
43	0.238811E-03	0.304404E-04	0.127466E+00
44	0.392777E-04	0.583899E-05	0.148659E+00
45	0.818325E-05	0.123329E-05	0.150710E+00
50	0.548734E-05	0.107239E-05	0.195430E+00
51	0.105736E-05	0.214457E-06	0.202823E+00

-- Non-Linear Least Squares Fit --

Default Tolerances Used

Scaled Gradient Tolerance = 6.055454E-06  
 Scaled Step Tolerance = 3.666853E-11  
 Relative Function Tolerance = 3.666853E-11  
 Absolute Function Tolerance = 4.930381E-32

VPA Method Options

- Catchability Values Estimated as an Analytic Function of N
- Catch Equation Used in Cohort Solution
- Plus Group Backward Calculation Method Used
- Rivard Weights Used for JAN-1 Biomass
- Rivard Weights Calculation Used 3 Years for Terminal Year Plus One
  
- Heincke Rule Used in F-Oldest Calculation
- F-Oldest Calculation in Years Prior to Terminal Year  
 Uses Stock Sizes in Ages 3 to 6
- Calculation of Population of Age 0 In Year 2007  
 = CDF Using First Age Populations  
 Year Range Applied = 1982 to 2005

Stock Estimates

Age 1  
 Age 2  
 Age 3  
 Age 4  
 Age 5  
 Age 6

Full F in Terminal Year = 0.4413

F in Oldest True Age in Terminal Year = 0.4413

Full F Calculated Using Classic Method

Age	Input Partial Recruitment	Calc Partial Recruitment	Fishing Mortality	Used In Full F	Comments
0	0.020	0.012	0.0068	NO	Stock Estimate in
T+1					
1	0.130	0.162	0.0897	NO	Stock Estimate in
T+1					
2	0.670	0.421	0.2336	NO	Stock Estimate in
T+1					
3	1.000	0.784	0.4346	YES	Stock Estimate in
T+1					
4	1.000	0.605	0.3351	YES	Stock Estimate in
T+1					
5	1.000	1.000	0.5542	YES	Stock Estimate in
T+1					
6	1.000	0.796	0.4413		Input PR * Full F

Catch At Age - Input Data

AGE	1982	1983	1984	1985	1986
0	5344.0	4925.0	4802.0	2078.0	1942.0
1	19423.0	28441.0	26582.0	14623.0	17140.0
2	10149.0	10911.0	15454.0	17979.0	11055.0
3	935.0	2181.0	3180.0	1767.0	3782.0
4	328.0	693.0	829.0	496.0	316.0
5	116.0	323.0	95.0	252.0	140.0
6	67.0	16.0	4.0	30.0	58.0
7	30.0	43.0	10.0	8.0	15.0
AGE	1987	1988	1989	1990	1991
0	1137.0	795.0	960.0	1856.0	1001.0
1	17212.0	20557.0	4790.0	8808.0	12149.0
2	10838.0	14562.0	7306.0	2187.0	7148.0
3	1648.0	2137.0	1692.0	995.0	742.0
4	544.0	644.0	353.0	221.0	217.0
5	25.0	121.0	55.0	30.0	32.0
6	29.0	19.0	9.0	8.0	3.0
7	44.0	21.0	4.0	3.0	1.0
AGE	1992	1993	1994	1995	1996
0	1368.0	1285.0	1638.0	592.0	162.0
1	11197.0	11235.0	10362.0	5828.0	6925.0
2	6026.0	5601.0	6996.0	7303.0	9278.0
3	1125.0	566.0	982.0	1239.0	1785.0
4	151.0	73.0	205.0	397.0	417.0
5	70.0	45.0	26.0	77.0	71.0
6	2.0	20.0	14.0	4.0	16.0
7	1.0	3.0	5.0	1.0	3.0
AGE	1997	1998	1999	2000	2001
0	30.0	45.0	181.0	22.0	11.0
1	2545.0	2233.0	2185.0	1538.0	2888.0
2	8046.0	6380.0	6260.0	7967.0	4760.0
3	3149.0	5243.0	4018.0	4670.0	3737.0
4	553.0	980.0	1161.0	1529.0	1293.0
5	160.0	138.0	358.0	370.0	363.0
6	11.0	19.0	55.0	74.0	123.0
7	4.0	1.0	14.0	29.0	33.0

Catch At Age - Input Data

AGE	2002	2003	2004	2005	2006
0	272.0	259.0	107.0	245.0	191.0
1	1135.0	1583.0	1053.0	1936.0	1072.0
2	5411.0	4937.0	5668.0	3717.0	5070.0
3	3839.0	4002.0	4688.0	4045.0	3276.0
4	1302.0	1579.0	1907.0	2206.0	1796.0
5	319.0	563.0	769.0	1049.0	869.0
6	135.0	233.0	304.0	510.0	372.0
7	25.0	86.0	156.0	470.0	180.0

Weight At Age - Input Data

AGE	1982	1983	1984	1985	1986
0	0.2540	0.2400	0.2480	0.2890	0.2530
1	0.4180	0.4170	0.3960	0.4280	0.4530
2	0.6160	0.7160	0.6320	0.6130	0.6680
3	1.4470	1.0750	1.0460	1.1090	1.1600
4	1.9070	1.2570	1.5000	1.7260	1.7390
5	2.7950	1.4950	2.1630	2.2970	1.9940
6	2.6730	2.5720	3.3020	2.6710	3.3110
7	3.8510	2.5990	3.9200	4.7260	4.0910
AGE	1987	1988	1989	1990	1991
0	0.2590	0.3160	0.2080	0.2520	0.1450
1	0.4420	0.4630	0.4600	0.4310	0.4070
2	0.6510	0.6240	0.7230	0.8100	0.7020
3	1.1400	1.1300	1.0440	1.1690	1.1860
4	1.9410	1.7390	1.4790	1.5380	1.8110
5	2.8620	2.4850	2.2490	2.1210	2.5270
6	3.3370	3.8880	2.3990	3.4610	2.8370
7	3.5140	3.7610	2.7090	4.3660	3.5860
AGE	1992	1993	1994	1995	1996
0	0.2450	0.2640	0.3550	0.3900	0.3300
1	0.4700	0.4860	0.5280	0.5370	0.5100
2	0.7490	0.6990	0.6280	0.6780	0.5700
3	1.2220	1.4610	1.3530	1.0560	1.0800
4	1.3900	1.6590	2.0960	1.6390	1.5450
5	2.6960	1.8590	2.7360	2.6280	1.9570
6	2.3020	2.8160	3.4370	3.7500	2.5460
7	4.4790	2.4760	3.7050	4.0470	2.9890
AGE	1997	1998	1999	2000	2001
0	0.2120	0.2590	0.1430	0.0660	0.1140
1	0.4520	0.4900	0.3710	0.5080	0.5440
2	0.6390	0.6480	0.5940	0.6920	0.7660
3	0.8660	0.8590	0.8960	0.9250	0.9680
4	1.2330	1.3210	1.4390	1.3300	1.4490
5	2.2520	2.4100	1.9980	2.2190	2.1450
6	2.5720	2.5770	2.7160	2.5990	2.5970
7	2.9500	3.9830	3.4990	2.8260	3.3220

Weight At Age - Input Data

AGE	2002	2003	2004	2005	2006
0	0.1470	0.1490	0.3060	0.2020	0.1490
1	0.4930	0.5070	0.5170	0.4290	0.4430
2	0.7360	0.7590	0.7390	0.6920	0.6830
3	0.9580	1.0340	0.9680	0.9280	0.9600
4	1.3710	1.5310	1.3480	1.1860	1.2630
5	2.0990	2.0720	1.7520	1.5030	1.6440
6	2.6660	2.7590	2.3540	1.8890	2.1840
7	3.7420	3.9520	3.7360	3.6350	3.7870

JAN-1 Weights at Age - Input Data

AGE	1982	1983	1984	1985	1986
0	0.0000	0.0000	0.0000	0.0000	0.0000
1	0.3194	0.3255	0.3083	0.3258	0.3618
2	0.4663	0.5471	0.5134	0.4927	0.5347
3	1.5525	0.8138	0.8654	0.8372	0.8433
4	2.1538	1.3487	1.2698	1.3437	1.3887
5	2.9136	1.6885	1.6489	1.8562	1.8552
6	2.7333	2.6812	2.2218	2.4036	2.7578
7	3.8510	2.5990	3.9200	4.7260	4.0910
AGE	1987	1988	1989	1990	1991
0	0.0000	0.0000	0.0000	0.0000	0.0000
1	0.3344	0.3463	0.3813	0.2994	0.3203
2	0.5430	0.5252	0.5786	0.6104	0.5501
3	0.8727	0.8577	0.8071	0.9193	0.9801
4	1.5005	1.4080	1.2928	1.2672	1.4550
5	2.2309	2.1962	1.9776	1.7711	1.9714
6	2.5795	3.3358	2.4416	2.7899	2.4530
7	3.5140	3.7610	2.7090	4.3660	3.5860
AGE	1992	1993	1994	1995	1996
0	0.0000	0.0000	0.0000	0.0000	0.0000
1	0.2611	0.3451	0.3734	0.4366	0.4460
2	0.5521	0.5732	0.5525	0.5983	0.5533
3	0.9262	1.0461	0.9725	0.8144	0.8557
4	1.2840	1.4238	1.7499	1.4892	1.2773
5	2.2096	1.6075	2.1305	2.3470	1.7910
6	2.4119	2.7553	2.5277	3.2031	2.5867
7	4.4790	2.4760	3.7050	4.0470	2.9890
AGE	1997	1998	1999	2000	2001
0	0.0000	0.0000	0.0000	0.0000	0.0000
1	0.3862	0.3223	0.3100	0.2695	0.1895
2	0.5709	0.5412	0.5395	0.5067	0.6238
3	0.7026	0.7409	0.7620	0.7412	0.8184
4	1.1540	1.0696	1.1118	1.0916	1.1577
5	1.8653	1.7238	1.6246	1.7869	1.6890
6	2.2435	2.4090	2.5584	2.2788	2.4006
7	2.9500	3.9830	3.4990	2.8260	3.3220

JAN-1 Weights at Age - Input Data

AGE	2002	2003	2004	2005	2006
0	0.0000	0.0000	0.0000	0.0000	0.0000
1	0.2371	0.2730	0.2775	0.3623	0.2991
2	0.6328	0.6117	0.6121	0.5981	0.5413
3	0.8566	0.8724	0.8572	0.8281	0.8151
4	1.1520	1.2111	1.1806	1.0715	1.0826
5	1.7440	1.6854	1.6378	1.4234	1.3963
6	2.3914	2.4065	2.2085	1.8192	1.8118
7	3.7420	3.9520	3.7360	3.6350	3.7870
AGE	2007				
0	0.0000				
1	0.3130				
2	0.5838				
3	0.8334				
4	1.1116				
5	1.4858				
6	1.9465				
7	3.7193				



SSB Weight At Age - Input Data

AGE	1982	1983	1984	1985	1986
0	0.3020	0.2860	0.3000	0.3380	0.3080
1	0.5040	0.4820	0.4610	0.4990	0.5130
2	0.7490	0.8160	0.7690	0.7670	0.8050
3	1.3810	1.2060	1.2450	1.2960	1.3880
4	1.7610	1.5200	1.7390	1.8130	2.0690
5	2.7190	1.9820	2.3240	2.6060	2.3860
6	2.6230	3.4750	4.2560	3.6220	3.4470
7	3.8510	2.5990	3.9200	4.7260	4.0910
AGE	1987	1988	1989	1990	1991
0	0.3170	0.3600	0.2690	0.2980	0.2230
1	0.4980	0.5400	0.5610	0.5110	0.5040
2	0.7890	0.7470	0.8550	0.9240	0.8520
3	1.3200	1.2390	1.1940	1.3610	1.2520
4	2.1120	1.8990	1.6750	1.8280	2.0780
5	3.1790	2.4560	2.6110	2.3430	2.4500
6	3.6210	3.0980	3.7170	3.5450	3.9370
7	3.5140	3.7610	2.7090	4.3660	3.5860
AGE	1992	1993	1994	1995	1996
0	0.3120	0.3370	0.4100	0.4280	0.3680
1	0.5390	0.5310	0.5750	0.5480	0.5510
2	0.9480	0.8820	0.7530	0.7970	0.6590
3	1.3570	1.6550	1.4440	1.2040	1.1300
4	1.5360	1.9750	2.2640	1.7410	1.7600
5	2.7360	2.3070	3.0490	2.6000	2.1490
6	2.4190	3.4120	3.8460	3.2400	2.8170
7	4.4790	2.4760	3.7050	4.0470	2.9890
AGE	1997	1998	1999	2000	2001
0	0.2860	0.2930	0.2280	0.1490	0.1960
1	0.5120	0.5230	0.4620	0.5860	0.6030
2	0.7070	0.7240	0.6920	0.7770	0.8270
3	1.0020	1.0280	1.0270	1.0800	1.0910
4	1.5620	1.5240	1.6710	1.5710	1.6470
5	2.3570	2.5090	2.1820	2.3370	2.3100
6	3.5170	3.1950	2.7900	3.0790	3.3640
7	2.9500	3.9830	3.4990	2.8260	3.3220

SSB Weight At Age - Input Data

AGE	2002	2003	2004	2005	2006
0	0.2310	0.2370	0.2790	0.2670	0.2470
1	0.5730	0.5770	0.5800	0.5050	0.5380
2	0.8270	0.8240	0.7970	0.7740	0.7840
3	1.1280	1.1310	1.0370	1.0310	1.0610
4	1.5820	1.6020	1.3970	1.3270	1.4120
5	2.3050	2.1630	1.7960	1.7100	1.8470
6	3.5280	3.4140	3.2060	3.1600	3.2130
7	3.7420	3.9520	3.7360	3.6350	3.7870

Natural Mortality - Input Data

AGE	1982	1983	1984	1985	1986
0	0.2000	0.2000	0.2000	0.2000	0.2000
1	0.2000	0.2000	0.2000	0.2000	0.2000
2	0.2000	0.2000	0.2000	0.2000	0.2000
3	0.2000	0.2000	0.2000	0.2000	0.2000
4	0.2000	0.2000	0.2000	0.2000	0.2000
5	0.2000	0.2000	0.2000	0.2000	0.2000
6	0.2000	0.2000	0.2000	0.2000	0.2000
7	0.2000	0.2000	0.2000	0.2000	0.2000
AGE	1987	1988	1989	1990	1991
0	0.2000	0.2000	0.2000	0.2000	0.2000
1	0.2000	0.2000	0.2000	0.2000	0.2000
2	0.2000	0.2000	0.2000	0.2000	0.2000
3	0.2000	0.2000	0.2000	0.2000	0.2000
4	0.2000	0.2000	0.2000	0.2000	0.2000
5	0.2000	0.2000	0.2000	0.2000	0.2000
6	0.2000	0.2000	0.2000	0.2000	0.2000
7	0.2000	0.2000	0.2000	0.2000	0.2000
AGE	1992	1993	1994	1995	1996
0	0.2000	0.2000	0.2000	0.2000	0.2000
1	0.2000	0.2000	0.2000	0.2000	0.2000
2	0.2000	0.2000	0.2000	0.2000	0.2000
3	0.2000	0.2000	0.2000	0.2000	0.2000
4	0.2000	0.2000	0.2000	0.2000	0.2000
5	0.2000	0.2000	0.2000	0.2000	0.2000
6	0.2000	0.2000	0.2000	0.2000	0.2000
7	0.2000	0.2000	0.2000	0.2000	0.2000
AGE	1997	1998	1999	2000	2001
0	0.2000	0.2000	0.2000	0.2000	0.2000
1	0.2000	0.2000	0.2000	0.2000	0.2000
2	0.2000	0.2000	0.2000	0.2000	0.2000
3	0.2000	0.2000	0.2000	0.2000	0.2000
4	0.2000	0.2000	0.2000	0.2000	0.2000
5	0.2000	0.2000	0.2000	0.2000	0.2000
6	0.2000	0.2000	0.2000	0.2000	0.2000
7	0.2000	0.2000	0.2000	0.2000	0.2000

Natural Mortality - Input Data

AGE	2002	2003	2004	2005	2006
0	0.2000	0.2000	0.2000	0.2000	0.2000
1	0.2000	0.2000	0.2000	0.2000	0.2000
2	0.2000	0.2000	0.2000	0.2000	0.2000
3	0.2000	0.2000	0.2000	0.2000	0.2000
4	0.2000	0.2000	0.2000	0.2000	0.2000
5	0.2000	0.2000	0.2000	0.2000	0.2000
6	0.2000	0.2000	0.2000	0.2000	0.2000
7	0.2000	0.2000	0.2000	0.2000	0.2000
Proportion of Natural Mortality Before Spawning =					0.8300
Proportion of Fishing Mortality Before Spawning =					0.8300

Maturity - Input Data

AGE	1982	1983	1984	1985	1986
0	0.3800	0.3800	0.3800	0.3800	0.3800
1	0.9100	0.9100	0.9100	0.9100	0.9100
2	0.9800	0.9800	0.9800	0.9800	0.9800
3	1.0000	1.0000	1.0000	1.0000	1.0000
4	1.0000	1.0000	1.0000	1.0000	1.0000
5	1.0000	1.0000	1.0000	1.0000	1.0000
6	1.0000	1.0000	1.0000	1.0000	1.0000
7	1.0000	1.0000	1.0000	1.0000	1.0000
AGE	1987	1988	1989	1990	1991
0	0.3800	0.3800	0.3800	0.3800	0.3800
1	0.9100	0.9100	0.9100	0.9100	0.9100
2	0.9800	0.9800	0.9800	0.9800	0.9800
3	1.0000	1.0000	1.0000	1.0000	1.0000
4	1.0000	1.0000	1.0000	1.0000	1.0000
5	1.0000	1.0000	1.0000	1.0000	1.0000
6	1.0000	1.0000	1.0000	1.0000	1.0000
7	1.0000	1.0000	1.0000	1.0000	1.0000
AGE	1992	1993	1994	1995	1996
0	0.3800	0.3800	0.3800	0.3800	0.3800
1	0.9100	0.9100	0.9100	0.9100	0.9100
2	0.9800	0.9800	0.9800	0.9800	0.9800
3	1.0000	1.0000	1.0000	1.0000	1.0000
4	1.0000	1.0000	1.0000	1.0000	1.0000
5	1.0000	1.0000	1.0000	1.0000	1.0000
6	1.0000	1.0000	1.0000	1.0000	1.0000
7	1.0000	1.0000	1.0000	1.0000	1.0000
AGE	1997	1998	1999	2000	2001
0	0.3800	0.3800	0.3800	0.3800	0.3800
1	0.9100	0.9100	0.9100	0.9100	0.9100
2	0.9800	0.9800	0.9800	0.9800	0.9800
3	1.0000	1.0000	1.0000	1.0000	1.0000
4	1.0000	1.0000	1.0000	1.0000	1.0000
5	1.0000	1.0000	1.0000	1.0000	1.0000
6	1.0000	1.0000	1.0000	1.0000	1.0000
7	1.0000	1.0000	1.0000	1.0000	1.0000

Maturity - Input Data

AGE	2002	2003	2004	2005	2006
0	0.3800	0.3800	0.3800	0.3800	0.3800
1	0.9100	0.9100	0.9100	0.9100	0.9100
2	0.9800	0.9800	0.9800	0.9800	0.9800
3	1.0000	1.0000	1.0000	1.0000	1.0000
4	1.0000	1.0000	1.0000	1.0000	1.0000
5	1.0000	1.0000	1.0000	1.0000	1.0000
6	1.0000	1.0000	1.0000	1.0000	1.0000
7	1.0000	1.0000	1.0000	1.0000	1.0000

Input Partial Recruitment

AGE

0	0.0200
1	0.1300
2	0.6700
3	1.0000
4	1.0000
5	1.0000
6	1.0000

Input F-Plus Ratio

YEAR

1982	1.0000
1983	1.0000
1984	1.0000
1985	1.0000
1986	1.0000
1987	1.0000
1988	1.0000
1989	1.0000
1990	1.0000
1991	1.0000
1992	1.0000
1993	1.0000
1994	1.0000
1995	1.0000
1996	1.0000
1997	1.0000
1998	1.0000
1999	1.0000
2000	1.0000
2001	1.0000
2002	1.0000
2003	1.0000
2004	1.0000
2005	1.0000
2006	1.0000

SURVEY - INPUT DATA

INDEX	1	2	3	4	5
SURVEY TAG	NEC_W	NEC_W	NEC_W	NEC_W	NEC_W
AGE	1	2	3	4	5 - 7
TIME	JAN-1	JAN-1	JAN-1	JAN-1	JAN-1
TYPE	NUMBERS	NUMBERS	NUMBERS	NUMBERS	NUMBERS
RETRO FLAG	1	1	1	1	1
1982	0.0000	0.0000	0.0000	0.0000	0.0000
1983	0.0000	0.0000	0.0000	0.0000	0.0000
1984	0.0000	0.0000	0.0000	0.0000	0.0000
1985	0.0000	0.0000	0.0000	0.0000	0.0000
1986	0.0000	0.0000	0.0000	0.0000	0.0000
1987	0.0000	0.0000	0.0000	0.0000	0.0000
1988	0.0000	0.0000	0.0000	0.0000	0.0000
1989	0.0000	0.0000	0.0000	0.0000	0.0000
1990	0.0000	0.0000	0.0000	0.0000	0.0000
1991	0.0000	0.0000	0.0000	0.0000	0.0000
1992	7.1500	4.7400	0.3300	0.0400	0.0400
1993	6.5000	6.7000	0.3100	0.0500	0.0400
1994	3.7600	7.2000	0.8200	0.2600	0.0100
1995	6.0700	4.5900	0.2500	0.0200	0.0000
1996	22.1700	8.3300	0.6000	0.1200	0.0300
1997	3.8600	4.8000	1.0400	0.4300	0.1500
1998	1.6800	3.2500	2.2900	0.4200	0.1200
1999	2.1100	4.8000	2.9000	0.8400	0.4100
2000	0.7000	6.5200	4.9600	2.5100	1.0800
2001	3.0700	5.3300	6.4200	2.4400	1.3400
2002	2.7700	10.7400	5.5800	2.2600	1.3300
2003	8.1700	14.3600	8.4800	2.6700	1.9600
2004	1.4500	8.6800	4.5600	1.6400	1.4400
2005	2.9600	4.0300	3.0700	1.3400	1.4900
2006	2.6400	9.0600	4.2900	2.4700	2.5800
2007	2.7700	6.1800	5.1500	1.5400	1.1900



SURVEY - INPUT DATA

INDEX	6	7	8	9	10
SURVEY TAG	NEC_S	NEC_S	NEC_S	NEC_S	NEC_S
AGE	1	2	3	4	5 - 7
TIME	JAN-1	JAN-1	JAN-1	JAN-1	JAN-1
TYPE	NUMBERS	NUMBERS	NUMBERS	NUMBERS	NUMBERS
RETRO FLAG	1	1	1	1	1
1982	0.7000	1.4300	0.1200	0.0200	0.0000
1983	0.3200	0.3900	0.1900	0.0300	0.0200
1984	0.1700	0.3300	0.0900	0.0500	0.0200
1985	0.5500	1.5600	0.2100	0.0400	0.0200
1986	1.4800	0.4300	0.2000	0.0200	0.0100
1987	0.4700	0.4300	0.0200	0.0100	0.0000
1988	0.6000	0.8100	0.0700	0.0200	0.0000
1989	0.0600	0.2300	0.0200	0.0100	0.0000
1990	0.6300	0.0300	0.0600	0.0000	0.0000
1991	0.7900	0.2700	0.0000	0.0200	0.0000
1992	0.7700	0.4100	0.0100	0.0000	0.0100
1993	0.7300	0.5000	0.0400	0.0000	0.0000
1994	0.3500	0.5300	0.0400	0.0100	0.0000
1995	0.7900	0.2700	0.0200	0.0000	0.0100
1996	1.0800	0.5600	0.1200	0.0000	0.0000
1997	0.2900	0.6700	0.0900	0.0100	0.0000
1998	0.2700	0.5200	0.3200	0.0600	0.0200
1999	0.2200	0.7400	0.4800	0.1300	0.0300
2000	0.1900	1.0300	0.6300	0.1200	0.1700
2001	0.4800	0.8900	1.0200	0.2000	0.1000
2002	0.3400	0.8900	0.7400	0.3100	0.1900
2003	0.5400	1.2900	0.5900	0.2900	0.2100
2004	0.3000	1.4500	0.8500	0.2700	0.1500
2005	0.2600	0.6500	0.5800	0.1500	0.1700
2006	0.0400	1.0400	0.2400	0.2500	0.2000
2007	0.2400	0.5200	1.4600	0.5700	0.4600

SURVEY - INPUT DATA

INDEX	11	12	13	14	15
SURVEY TAG	NEC_F	NEC_F	NEC_F	MA_S	MA_S
AGE	2	3	4	1	2
TIME	JAN-1	JAN-1	JAN-1	JAN-1	JAN-1
TYPE	NUMBERS	NUMBERS	NUMBERS	NUMBERS	NUMBERS
RETRO FLAG	1	1	1	0	0
1982	0.0000	0.0000	0.0000	0.3500	1.5840
1983	1.5200	0.4000	0.0300	0.0510	0.5990
1984	1.4600	0.3400	0.1200	0.0440	0.0780
1985	1.3900	0.4300	0.0700	0.1540	1.2600
1986	0.8000	0.4600	0.0500	0.9950	0.5220
1987	0.8300	0.1100	0.1100	0.6560	0.6400
1988	0.5800	0.2000	0.0300	0.2110	1.0050
1989	0.6200	0.1800	0.0300	0.0000	0.3630
1990	0.2100	0.0500	0.0000	0.2570	0.0210
1991	0.3800	0.0300	0.0400	0.0320	0.0500
1992	0.8400	0.0900	0.0000	0.2800	0.3420
1993	1.0400	0.2500	0.0300	0.1260	0.4920
1994	0.8000	0.0300	0.0100	1.8600	1.2170
1995	0.6700	0.0900	0.0100	0.1040	1.3020
1996	1.1600	0.2800	0.0200	0.0760	0.6860
1997	1.2400	0.5700	0.0400	0.5440	1.2790
1998	1.2900	1.1400	0.2900	0.1440	1.2120
1999	2.1300	1.6300	0.3300	0.0780	0.8780
2000	1.7300	1.4900	0.3100	0.2370	1.6590
2001	1.2000	1.2200	0.4000	0.1860	1.0260
2002	1.3600	0.9300	0.3700	0.1510	1.5110
2003	1.1700	0.8600	0.3500	0.2060	1.4400
2004	1.3100	1.0300	0.2500	0.0270	0.2830
2005	1.4900	1.3700	0.6600	0.1360	0.3510
2006	1.1400	0.5400	0.4700	0.0490	2.4400
2007	0.7200	1.2200	0.3500	0.0000	0.0000

SURVEY - INPUT DATA

INDEX	16	17	18	19	20
SURVEY TAG	MA_S	MA_F	MA_F	MA_F	CT_S
AGE	3	2	3	4	1
TIME	JAN-1	JAN-1	JAN-1	JAN-1	JAN-1
TYPE	NUMBERS	NUMBERS	NUMBERS	NUMBERS	NUMBERS
RETRO FLAG	0	1	1	1	0
1982	0.1420	0.4000	0.4050	0.0120	0.0000
1983	0.4500	0.2340	1.6620	0.0200	0.0000
1984	0.0670	0.0330	0.6250	0.1540	0.3140
1985	0.0360	0.4850	0.2670	0.1270	0.0150
1986	0.1850	0.1170	1.8950	0.0400	0.7530
1987	0.0130	2.3160	0.6790	0.2140	0.9510
1988	0.1230	1.2020	0.6630	0.0110	0.2320
1989	0.1020	0.4740	0.4290	0.0060	0.0130
1990	0.0810	0.0000	0.3170	0.0160	0.3040
1991	0.0120	0.1130	0.0000	0.0110	0.3920
1992	0.0900	0.5310	0.2880	0.0060	0.3190
1993	0.0650	1.1810	0.1860	0.0000	0.3200
1994	0.0480	0.3350	0.4780	0.0300	0.4960
1995	0.0530	2.2340	0.0760	0.0000	0.1990
1996	0.1140	0.3420	0.5060	0.0000	0.5780
1997	0.1810	0.7610	1.2820	0.1140	0.3910
1998	0.6590	0.4940	1.5080	0.3510	0.0640
1999	1.1120	0.0120	0.5900	0.2620	0.2450
2000	1.2050	0.3470	0.9400	0.3790	0.3210
2001	0.7300	1.3830	2.3030	0.4940	0.8410
2002	0.3970	1.2440	1.0830	0.3070	1.0570
2003	0.6240	2.6810	1.3020	0.1780	1.6080
2004	0.3230	3.0590	1.2540	0.2560	0.2590
2005	1.0290	0.5890	1.4550	0.1360	0.2530
2006	0.9750	1.5570	2.0490	1.3500	0.0380
2007	0.0000	0.5860	3.7450	0.5590	0.0000

SURVEY - INPUT DATA

INDEX	21	22	23	24	25
SURVEY TAG	CT_S	CT_S	CT_S	CT_F	CT_F
AGE	2	3	4	2	3
TIME	JAN-1	JAN-1	JAN-1	JAN-1	JAN-1
TYPE	NUMBERS	NUMBERS	NUMBERS	NUMBERS	NUMBERS
RETRO FLAG	0	0	0	1	1
1982	0.0000	0.0000	0.0000	0.0000	0.0000
1983	0.0000	0.0000	0.0000	0.0000	0.0000
1984	0.2710	0.0440	0.0000	0.0000	0.0000
1985	0.3250	0.0400	0.0580	0.5710	0.3310
1986	0.1000	0.0820	0.0080	0.3390	0.5280
1987	0.0860	0.0140	0.0040	1.1700	0.2980
1988	0.2230	0.0350	0.0090	1.0670	0.2230
1989	0.0490	0.0240	0.0160	0.8840	0.4810
1990	0.0220	0.0130	0.0060	0.0290	0.0950
1991	0.1890	0.0290	0.0280	0.6740	0.1100
1992	0.1880	0.0210	0.0040	0.8260	0.3400
1993	0.1510	0.0150	0.0180	0.5700	0.3660
1994	0.3140	0.0250	0.0180	0.8270	0.1520
1995	0.0510	0.0200	0.0050	0.3000	0.0850
1996	0.2660	0.0860	0.0230	0.3840	0.1170
1997	0.5070	0.0570	0.0360	0.8870	1.1880
1998	0.5940	0.5030	0.1160	0.6810	1.3730
1999	0.5930	0.3850	0.1390	0.2690	1.0540
2000	0.7260	0.5240	0.0740	0.6790	1.4840
2001	0.3400	0.3650	0.1200	0.3950	0.8710
2002	1.2640	0.4650	0.2330	2.6890	1.1370
2003	1.0160	0.3950	0.2320	3.0870	1.9300
2004	0.8180	0.4100	0.1940	1.4590	1.3190
2005	0.2640	0.1500	0.0330	0.3850	0.7550
2006	0.3600	0.0680	0.0650	1.0930	0.7440
2007	0.0000	0.0000	0.0000	0.2170	0.5920

SURVEY - INPUT DATA

INDEX	26	27	28	29	30
SURVEY TAG	CT_F	CT_F	RI_F	RI_F	RI_F
AGE	4	5 - 7	2	3	4
TIME	JAN-1	JAN-1	JAN-1	JAN-1	JAN-1
TYPE	NUMBERS	NUMBERS	NUMBERS	NUMBERS	NUMBERS
RETRO FLAG	1	1	1	1	1
1982	0.0000	0.0000	0.9700	1.7400	0.2000
1983	0.0000	0.0000	0.2100	0.5200	0.0700
1984	0.0000	0.0000	0.1400	0.4200	0.1100
1985	0.0720	0.0250	0.7400	0.4900	0.1000
1986	0.0750	0.0090	0.3100	0.2800	0.0200
1987	0.0720	0.0070	2.4500	0.5100	0.1300
1988	0.0330	0.0030	0.9400	0.3700	0.0200
1989	0.0370	0.0030	0.3400	0.2400	0.0000
1990	0.0150	0.0010	0.0150	0.0700	0.0000
1991	0.0420	0.0120	0.6700	0.1200	0.0000
1992	0.0360	0.0220	0.1200	0.0800	0.0100
1993	0.0460	0.0250	0.7700	0.4100	0.1100
1994	0.0390	0.0070	0.4100	0.2200	0.0700
1995	0.0240	0.0090	0.1200	0.0300	0.0000
1996	0.0120	0.0050	0.5300	0.2000	0.0000
1997	0.0420	0.0050	0.9500	1.0300	0.0100
1998	0.3730	0.0400	0.5600	0.9600	0.0300
1999	0.3210	0.0750	0.0900	0.3600	0.0900
2000	0.3460	0.1270	1.0400	1.9100	0.3500
2001	0.3410	0.1910	0.5000	1.2400	0.4500
2002	0.4360	0.1340	1.0500	0.6300	0.3000
2003	0.4790	0.1830	2.4200	1.3800	0.4000
2004	0.4070	0.2030	2.3500	2.0800	0.4900
2005	0.4400	0.1190	0.4800	1.3000	0.7800
2006	0.3550	0.1510	0.8400	1.3800	0.6900
2007	0.2300	0.1790	0.1400	1.1300	0.4400

SURVEY - INPUT DATA

INDEX	31	32	33	34	35
SURVEY TAG	RI_X	RI_X	NJ	NJ	NJ
AGE	1	2 - 7	1	2	3
TIME	JAN-1	JAN-1	JAN-1	JAN-1	JAN-1
TYPE	NUMBERS	NUMBERS	NUMBERS	NUMBERS	NUMBERS
RETRO FLAG	0	0	0	0	0
1982	0.0000	0.0000	0.0000	0.0000	0.0000
1983	0.0000	0.0000	0.0000	0.0000	0.0000
1984	0.0000	0.0000	0.0000	0.0000	0.0000
1985	0.0000	0.0000	0.0000	0.0000	0.0000
1986	0.0000	0.0000	0.0000	0.0000	0.0000
1987	0.0000	0.0000	0.0000	0.0000	0.0000
1988	0.0000	0.0000	3.0600	1.0300	0.0000
1989	0.0000	0.0000	0.5100	0.1800	0.0000
1990	0.1700	0.1000	1.4400	0.1100	0.0300
1991	0.0700	0.0800	2.6900	0.2700	0.0200
1992	0.1500	0.1800	3.0000	0.5700	0.0600
1993	0.1100	0.1400	5.6900	0.2000	0.0100
1994	0.0800	0.0500	1.0700	0.0800	0.0000
1995	0.2000	0.2200	2.9300	0.2800	0.0500
1996	0.4100	0.5300	5.1000	2.7000	0.1800
1997	0.1700	0.5200	8.2500	5.2500	1.0200
1998	0.0700	0.3600	5.8000	2.6700	0.2900
1999	0.2600	0.6100	6.1200	3.4600	0.6500
2000	0.6300	1.8900	3.9100	1.8200	0.4500
2001	0.4200	0.5500	3.3200	1.1800	0.4100
2002	0.8100	1.1100	9.1100	4.1300	1.2800
2003	1.4800	2.2500	5.6100	2.5500	0.5700
2004	0.5400	1.5300	6.2700	2.4900	0.5700
2005	0.5500	1.8900	5.9900	1.2400	0.5300
2006	0.1900	1.0900	5.7400	3.2200	0.4800
2007	0.0000	0.0000	0.0000	0.0000	0.0000

SURVEY - INPUT DATA

INDEX	36	37	38	39	40
SURVEY TAG	NJ	DE	DE	DE	CT_Y
AGE	4 - 7	1	2	3	0
TIME	JAN-1	JAN-1	JAN-1	JAN-1	JAN-1
TYPE	NUMBERS	NUMBERS	NUMBERS	NUMBERS	NUMBERS
RETRO FLAG	0	0	0	0	0
1982	0.0000	0.0000	0.0000	0.0000	0.0000
1983	0.0000	0.0000	0.0000	0.0000	0.0000
1984	0.0000	0.0000	0.0000	0.0000	0.0000
1985	0.0000	0.0000	0.0000	0.0000	0.2400
1986	0.0000	0.0000	0.0000	0.0000	0.1720
1987	0.0000	0.0000	0.0000	0.0000	0.0750
1988	0.0000	0.0000	0.0000	0.0000	0.0150
1989	0.0000	0.0000	0.0000	0.0000	0.0000
1990	0.0000	0.0000	0.0000	0.0000	0.0320
1991	0.0000	1.1300	0.1800	0.0400	0.0360
1992	0.0200	0.2800	0.0800	0.0000	0.0130
1993	0.0100	1.5600	0.7300	0.0700	0.0840
1994	0.0200	0.1400	0.2200	0.0800	0.1320
1995	0.1600	1.0000	0.2800	0.1000	0.0230
1996	0.0500	0.7300	0.4800	0.1000	0.0690
1997	0.1800	0.1200	0.4900	0.4700	0.0330
1998	0.0400	0.3100	0.8300	0.2900	0.0000
1999	0.1800	0.0600	0.7700	0.4700	0.0440
2000	0.2200	0.2400	0.3000	0.2800	0.0120
2001	0.1500	1.5500	0.4900	0.2600	0.0210
2002	0.8100	0.2300	0.0900	0.0000	0.4420
2003	0.5100	0.1400	0.2900	0.1500	0.0000
2004	0.4300	0.0700	0.0600	0.0100	0.2550
2005	0.3200	0.3000	0.1100	0.0200	0.0670
2006	0.4000	0.1000	0.2300	0.0700	0.0980
2007	0.0000	0.0000	0.0000	0.0000	0.0000

SURVEY - INPUT DATA

INDEX	41	42	43	44	45
SURVEY TAG	VA_CRY	NC_Y	MD_Y	NJ_Y	NEC_Y
AGE	0	0	0	0	0
TIME	JAN-1	JAN-1	JAN-1	JAN-1	JAN-1
TYPE	NUMBERS	NUMBERS	NUMBERS	NUMBERS	NUMBERS
RETRO FLAG	0	0	0	0	0
1982	2.2700	0.0000	3.4080	0.0000	0.5500
1983	5.0100	0.0000	17.6990	0.0000	0.9600
1984	1.5800	0.0000	13.3100	0.0000	0.1800
1985	1.2600	0.0000	12.8430	0.0000	0.5900
1986	1.2600	0.0000	59.5260	0.0000	0.3900
1987	0.3900	19.8600	7.5840	0.0000	0.0700
1988	0.5400	2.6100	1.7630	0.1700	0.0600
1989	1.2400	6.6300	2.8550	1.0000	0.3100
1990	2.5400	4.2700	4.7330	1.2800	0.4400
1991	2.6400	5.8500	7.3370	1.0000	0.7600
1992	0.8900	9.1400	8.4870	1.1000	0.9900
1993	0.5000	5.1300	4.1450	2.5500	0.2300
1994	2.4100	8.1700	22.3110	1.6600	0.7500
1995	0.6300	6.6500	13.0670	4.9500	0.9300
1996	0.8100	30.6700	6.4930	1.6600	0.1100
1997	0.8900	14.1400	7.9970	1.6500	0.1700
1998	0.7300	10.4400	14.9830	0.6700	0.3800
1999	0.5300	0.0000	8.5650	1.0300	0.2100
2000	0.5700	3.9400	9.8740	0.9500	0.2200
2001	0.4700	22.0300	13.5430	0.6200	0.1200
2002	0.7700	18.2800	5.4060	1.5100	0.0600
2003	0.4400	7.2300	8.1800	0.6000	0.1800
2004	1.3000	5.9000	6.9930	0.9000	0.3600
2005	0.3500	9.8800	2.1980	3.1100	0.1600
2006	0.8000	1.9600	9.6580	0.8100	0.3100
2007	0.0000	0.0000	0.0000	0.0000	0.0000



SURVEY - INPUT DATA

INDEX	46	47	48	49	50
SURVEY TAG	MA_Y	DE30_Y	RI_Y	DE_EY	DE_IY
AGE	0	0	0	0	0
TIME	JAN-1	JAN-1	JAN-1	JAN-1	JAN-1
TYPE	NUMBERS	NUMBERS	NUMBERS	NUMBERS	NUMBERS
RETRO FLAG	0	0	0	0	0
1982	3.0000	0.0000	0.0200	0.1100	0.0000
1983	3.0000	0.0000	0.0300	0.0310	0.0000
1984	1.0000	0.0000	0.0200	0.0760	0.0000
1985	19.0000	0.0000	0.3500	0.0630	0.0000
1986	5.0000	0.0000	0.3500	0.0960	0.3200
1987	4.0000	0.0000	0.0400	0.1360	0.2600
1988	2.0000	0.0000	0.0000	0.0070	0.0100
1989	3.0000	0.0000	0.0000	0.1150	0.1400
1990	11.0000	0.0000	0.0500	0.2290	0.3600
1991	4.0000	1.4400	0.0000	0.0730	0.3800
1992	0.0000	0.4700	0.0100	0.3150	0.3700
1993	2.0000	0.0400	0.0100	0.0290	0.0500
1994	1.0000	2.2800	0.0400	0.2940	0.5700
1995	13.0000	0.9400	0.0200	0.1700	0.3000
1996	7.0000	0.4600	0.1000	0.0330	0.0800
1997	0.0000	0.0300	0.0300	0.0160	0.2200
1998	12.0000	0.1100	0.0000	0.0250	0.3900
1999	13.0000	0.2000	0.0200	0.0480	0.3500
2000	10.0000	0.7900	0.4000	0.1770	0.2100
2001	1.0000	0.3400	0.0000	0.0740	0.1400
2002	70.0000	0.0400	0.4400	0.0670	0.1300
2003	11.0000	0.1500	0.1000	0.0910	0.2100
2004	4.0000	0.0200	0.0300	0.1010	0.2700
2005	0.0000	0.0000	0.0100	0.0040	0.0100
2006	43.0000	0.4100	0.1000	0.0200	0.1700
2007	0.0000	0.0000	0.0000	0.0000	0.0000

INDEX	51				
SURVEY TAG	RI_XY				
AGE	0	NUMBERS	NUMBERS	NUMBERS	NUMBERS
TIME	JAN-1	NUMBERS	NUMBERS	NUMBERS	NUMBERS
TYPE	NUMBERS	NUMBERS	NUMBERS	NUMBERS	NUMBERS
RETRO FLAG	0				
1982	0.0000				
1983	0.0000				
1984	0.0000				
1985	0.0000				
1986	0.0000				
1987	0.0000				
1988	0.0000				

1989	0.0000
1990	0.0200
1991	0.0000
1992	0.0100
1993	0.0100
1994	0.0400
1995	0.0300
1996	0.0200
1997	0.0400
1998	0.0000
1999	0.0300
2000	0.0900
2001	0.0100
2002	0.1100
2003	0.0500
2004	0.1000
2005	0.0400
2006	0.0400
2007	0.0000

Additional Output Files

Population File C:\F2008\ADAPT\F08\_BASE\_00.PP2  
 Auxilliary File C:\F2008\ADAPT\F08\_BASE\_00.AUX  
 Covariance File C:\F2008\ADAPT\F08\_BASE\_00.CV  
 Residuals File C:\F2008\ADAPT\F08\_BASE\_00.RSD  
 Log File C:\F2008\ADAPT\F08\_BASE\_00.LOG

Bootstrap Files

Bootstrap Stock Numbers C:\F2008\ADAPT\F08\_BASE\_00.BSN  
 Bootstrap Fishing Mortality C:\F2008\ADAPT\F08\_BASE\_00.BSF  
 Bootstrap Biomass C:\F2008\ADAPT\F08\_BASE\_00.BSB  
 Bootstrap Catchability C:\F2008\ADAPT\F08\_BASE\_00.BSQ

Estimation Results

JAN-1 Population Numbers

AGE	1982	1983	1984	1985	1986
0	72766.	78883.	47542.	47670.	52295.
1	42166.	54755.	60140.	34595.	37153.
2	15890.	17178.	19487.	25486.	15249.
3	2162.	4014.	4392.	2401.	4992.
4	780.	935.	1345.	791.	409.
5	157.	345.	155.	366.	208.
6	151.	27.	6.	42.	77.
7	67.	71.	14.	11.	20.
=====					
Total	134140.	156209.	133081.	111363.	110403.
AGE	1987	1988	1989	1990	1991
0	43018.	12833.	26720.	29764.	28185.
1	41062.	34194.	9790.	21010.	22694.
2	15113.	18227.	9742.	3742.	9325.
3	2737.	2812.	2159.	1545.	1120.
4	761.	778.	423.	282.	384.
5	57.	143.	74.	38.	37.
6	47.	24.	11.	12.	5.
7	71.	27.	5.	4.	2.
=====					
Total	102865.	69038.	48923.	56398.	61751.
AGE	1992	1993	1994	1995	1996
0	31780.	32665.	34771.	38198.	27954.
1	22172.	24784.	25584.	26990.	30739.
2	7761.	8170.	10256.	11676.	16856.
3	1351.	1062.	1738.	2211.	3083.
4	260.	123.	365.	550.	708.
5	121.	79.	36.	117.	100.
6	3.	37.	25.	7.	27.
7	1.	6.	9.	2.	5.
=====					
Total	63450.	66927.	72784.	79750.	79473.
AGE	1997	1998	1999	2000	2001
0	28783.	30888.	28646.	32574.	30385.
1	22741.	23539.	25248.	23290.	26650.
2	18941.	16325.	17259.	18701.	17680.
3	5544.	8314.	7655.	8522.	8188.
4	937.	1738.	2158.	2688.	2821.
5	210.	276.	552.	733.	841.
6	19.	31.	103.	135.	270.
7	7.	2.	26.	53.	73.
=====					
Total	77182.	81112.	81646.	86695.	86908.

JAN-1 Population Numbers

AGE	2002	2003	2004	2005	2006
0	35186.	26343.	42627.	17092.	31255.
1	24867.	28562.	21334.	34803.	13773.
2	19216.	19335.	21956.	16516.	26747.
3	10200.	10874.	11395.	12884.	10180.
4	3366.	4914.	5319.	5136.	6920.
5	1155.	1590.	2607.	2646.	2233.
6	364.	659.	798.	1444.	1228.
7	67.	243.	409.	1331.	553.
=====					
Total	94421.	92521.	106444.	91853.	92889.
=====					
AGE	2007				
=====					
0	32177.				
1	25417.				
2	10309.				
3	17337.				
4	5397.				
5	4052.				
6	1050.				
7	937.				
=====					
Total	96677.				

Fishing Mortality Calculated

AGE	1982	1983	1984	1985	1986
0	0.0844	0.0713	0.1179	0.0492	0.0418
1	0.6980	0.8331	0.6586	0.6192	0.6995
2	1.1758	1.1639	1.8939	1.4302	1.5177
3	0.6388	0.8934	1.5136	1.5702	1.6815
4	0.6148	1.5978	1.1022	1.1359	1.7679
5	1.5776	3.8962	1.0938	1.3612	1.2981
6	0.6639	1.0573	1.3915	1.4349	1.6703
7	0.6639	1.0573	1.3915	1.4349	1.6703
AGE	1987	1988	1989	1990	1991
0	0.0296	0.0707	0.0404	0.0712	0.0399
1	0.6122	1.0556	0.7617	0.6123	0.8729
2	1.4817	1.9333	1.6411	1.0060	1.7318
3	1.0584	1.6949	1.8341	1.1932	1.2589
4	1.4729	2.1550	2.2134	1.8275	0.9528
5	0.6492	2.3292	1.6175	1.8925	2.4672
6	1.1251	1.7945	1.8786	1.2780	1.1892
7	1.1251	1.7945	1.8786	1.2780	1.1892
AGE	1992	1993	1994	1995	1996
0	0.0486	0.0443	0.0533	0.0172	0.0064
1	0.7984	0.6823	0.5844	0.2707	0.2842
2	1.7892	1.3478	1.3342	1.1318	0.9121
3	2.1928	0.8671	0.9514	0.9384	0.9906
4	0.9925	1.0261	0.9410	1.5058	1.0183
5	0.9870	0.9633	1.4841	1.2495	1.4557
6	1.7790	0.8874	0.9566	1.0366	1.0052
7	1.7790	0.8874	0.9566	1.0366	1.0052
AGE	1997	1998	1999	2000	2001
0	0.0012	0.0016	0.0070	0.0007	0.0004
1	0.1315	0.1103	0.1002	0.0756	0.1271
2	0.6234	0.5573	0.5056	0.6259	0.3500
3	0.9597	1.1487	0.8466	0.9056	0.6889
4	1.0223	0.9478	0.8797	0.9620	0.6931
5	1.7155	0.7863	1.2111	0.7978	0.6373
6	0.9851	1.1008	0.8699	0.9110	0.6861
7	0.9851	1.1008	0.8699	0.9110	0.6861

Fishing Mortality Calculated

AGE	2002	2003	2004	2005	2006
0	0.0086	0.0109	0.0028	0.0159	0.0068
1	0.0516	0.0630	0.0559	0.0633	0.0897
2	0.3693	0.3288	0.3330	0.2839	0.2336
3	0.5304	0.5152	0.5969	0.4216	0.4346
4	0.5497	0.4339	0.4982	0.6330	0.3351
5	0.3609	0.4900	0.3906	0.5680	0.5542
6	0.5203	0.4892	0.5391	0.4885	0.4413
7	0.5203	0.4892	0.5391	0.4885	0.4413

Average Fishing Mortality For Ages 3- 5

Year            Average F    N Weighted    Biomass Wtd    Catch Wtd

---

1982	0.9438	0.6804	0.7098	0.7121
1983	2.1291	1.2136	1.4097	1.3494
1984	1.2365	1.4087	1.3731	1.4208
1985	1.3558	1.4521	1.4093	1.4636
1986	1.5825	1.6736	1.6624	1.6753
1987	1.0602	1.1406	1.1735	1.1555
1988	2.0597	1.8150	1.8788	1.8234
1989	1.8883	1.8885	1.9063	1.8922
1990	1.6378	1.3034	1.3416	1.3226
1991	1.5597	1.2119	1.2113	1.2309
1992	1.3908	1.9280	1.8020	1.9954
1993	0.9522	0.8886	0.8955	0.8904
1994	1.1255	0.9586	0.9657	0.9610
1995	1.2312	1.0594	1.1283	1.0839
1996	1.1549	1.0076	1.0197	1.0102
1997	1.2325	0.9921	1.0273	1.0000
1998	0.9609	1.1052	1.0845	1.1099
1999	0.9791	0.8729	0.8911	0.8771
2000	0.8884	0.9117	0.9079	0.9127
2001	0.6731	0.6862	0.6837	0.6864
2002	0.4803	0.5215	0.5122	0.5251
2003	0.4797	0.4899	0.4848	0.4920
2004	0.4952	0.5419	0.5230	0.5498
2005	0.5408	0.4928	0.5076	0.5065
2006	0.4413	0.4128	0.4149	0.4221

Back Calculated Partial Recruitment

AGE	1982	1983	1984	1985	1986
0	0.0535	0.0183	0.0623	0.0314	0.0236
1	0.4424	0.2138	0.3477	0.3944	0.3957
2	0.7453	0.2987	1.0000	0.9108	0.8585
3	0.4049	0.2293	0.7992	1.0000	0.9512
4	0.3897	0.4101	0.5820	0.7234	1.0000
5	1.0000	1.0000	0.5775	0.8669	0.7343
6	0.4208	0.2714	0.7347	0.9138	0.9448
7	0.4208	0.2714	0.7347	0.9138	0.9448
AGE	1987	1988	1989	1990	1991
0	0.0200	0.0304	0.0183	0.0376	0.0162
1	0.4132	0.4532	0.3441	0.3235	0.3538
2	1.0000	0.8300	0.7414	0.5316	0.7019
3	0.7144	0.7277	0.8287	0.6305	0.5103
4	0.9941	0.9252	1.0000	0.9657	0.3862
5	0.4382	1.0000	0.7307	1.0000	1.0000
6	0.7593	0.7704	0.8488	0.6753	0.4820
7	0.7593	0.7704	0.8488	0.6753	0.4820
AGE	1992	1993	1994	1995	1996
0	0.0222	0.0329	0.0359	0.0115	0.0044
1	0.3641	0.5063	0.3938	0.1798	0.1952
2	0.8159	1.0000	0.8990	0.7516	0.6265
3	1.0000	0.6433	0.6411	0.6232	0.6805
4	0.4526	0.7613	0.6340	1.0000	0.6995
5	0.4501	0.7148	1.0000	0.8298	1.0000
6	0.8113	0.6584	0.6446	0.6884	0.6905
7	0.8113	0.6584	0.6446	0.6884	0.6905
AGE	1997	1998	1999	2000	2001
0	0.0007	0.0014	0.0058	0.0008	0.0006
1	0.0766	0.0961	0.0827	0.0785	0.1833
2	0.3634	0.4851	0.4175	0.6506	0.5050
3	0.5594	1.0000	0.6991	0.9414	0.9939
4	0.5959	0.8251	0.7264	1.0000	1.0000
5	1.0000	0.6844	1.0000	0.8293	0.9195
6	0.5742	0.9582	0.7183	0.9470	0.9900
7	0.5742	0.9582	0.7183	0.9470	0.9900



Back Calculated Partial Recruitment

AGE	2002	2003	2004	2005	2006
0	0.0156	0.0212	0.0046	0.0252	0.0122
1	0.0939	0.1223	0.0937	0.1000	0.1618
2	0.6718	0.6382	0.5579	0.4485	0.4215
3	0.9648	1.0000	1.0000	0.6660	0.7842
4	1.0000	0.8422	0.8346	1.0000	0.6047
5	0.6565	0.9512	0.6544	0.8973	1.0000
6	0.9465	0.9496	0.9032	0.7718	0.7963
7	0.9465	0.9496	0.9032	0.7718	0.7963

JAN-1 Biomass

AGE	1982	1983	1984	1985	1986
0	0.	0.	0.	0.	0.
1	13468.	17823.	18541.	11271.	13442.
2	7409.	9398.	10005.	12557.	8154.
3	3357.	3267.	3800.	2010.	4210.
4	1680.	1260.	1708.	1063.	568.
5	458.	583.	255.	679.	386.
6	412.	71.	13.	102.	212.
7	260.	186.	56.	54.	81.
=====					
Total	27044.	32588.	34379.	27736.	27053.
AGE	1987	1988	1989	1990	1991
0	0.	0.	0.	0.	0.
1	13731.	11841.	3733.	6290.	7269.
2	8206.	9573.	5637.	2284.	5129.
3	2389.	2412.	1742.	1421.	1098.
4	1141.	1095.	547.	358.	558.
5	127.	314.	146.	67.	73.
6	120.	82.	28.	33.	11.
7	248.	102.	14.	20.	6.
=====					
Total	25963.	25418.	11846.	10473.	14145.
AGE	1992	1993	1994	1995	1996
0	0.	0.	0.	0.	0.
1	5789.	8553.	9553.	11784.	13710.
2	4285.	4683.	5667.	6986.	9327.
3	1251.	1111.	1690.	1801.	2638.
4	334.	176.	639.	818.	905.
5	268.	127.	77.	274.	179.
6	6.	102.	62.	22.	71.
7	6.	14.	33.	7.	15.
=====					
Total	11940.	14765.	17721.	21691.	26844.
AGE	1997	1998	1999	2000	2001
0	0.	0.	0.	0.	0.
1	8782.	7587.	7827.	6277.	5050.
2	10813.	8835.	9311.	9476.	11029.
3	3895.	6160.	5833.	6317.	6701.
4	1082.	1859.	2399.	2934.	3266.
5	391.	476.	896.	1310.	1420.
6	43.	74.	263.	307.	649.
7	20.	6.	92.	149.	241.
=====					
Total	25027.	24997.	26622.	26769.	28356.

JAN-1 Biomass

AGE	2002	2003	2004	2005	2006
0	0.	0.	0.	0.	0.
1	5896.	7797.	5920.	12609.	4119.
2	12160.	11827.	13439.	9878.	14478.
3	8738.	9487.	9768.	10670.	8298.
4	3878.	5951.	6279.	5503.	7492.
5	2014.	2681.	4270.	3766.	3118.
6	871.	1586.	1762.	2627.	2224.
7	252.	961.	1529.	4838.	2092.
=====					
Total	33808.	40291.	42967.	49892.	41822.

AGE	2007
0	0.
1	7956.
2	6019.
3	14449.
4	5999.
5	6021.
6	2044.
7	3487.
=====	
Total	45974.

Mean Biomass

AGE	1982	1983	1984	1985	1986
0	16087.	16581.	10100.	12194.	11753.
1	11631.	14235.	15984.	10108.	11100.
2	5317.	6712.	5157.	7706.	4866.
3	2118.	2624.	2198.	1248.	2609.
4	1017.	545.	1128.	754.	311.
5	206.	124.	188.	425.	215.
6	270.	39.	9.	56.	115.
7	174.	106.	28.	26.	37.
=====					
Total	36820.	40967.	34792.	32517.	31005.
AGE	1987	1988	1989	1990	1991
0	9955.	3553.	4940.	6569.	3633.
1	12427.	9016.	2893.	6200.	5664.
2	4762.	4700.	3219.	1761.	2898.
3	1775.	1425.	963.	975.	699.
4	717.	520.	236.	186.	412.
5	110.	129.	76.	34.	33.
6	86.	41.	11.	22.	7.
7	137.	44.	6.	10.	3.
=====					
Total	29970.	19428.	12344.	15756.	13350.
AGE	1992	1993	1994	1995	1996
0	6894.	7651.	10904.	13390.	8335.
1	6592.	8002.	9362.	11560.	12427.
2	2523.	2905.	3293.	4375.	5798.
3	627.	954.	1397.	1394.	1946.
4	211.	118.	457.	432.	633.
5	191.	87.	48.	162.	95.
6	3.	63.	50.	14.	41.
7	3.	8.	19.	4.	9.
=====					
Total	17043.	19789.	25530.	31332.	29284.
AGE	1997	1998	1999	2000	2001
0	5528.	7245.	3700.	1948.	3139.
1	8749.	9916.	8092.	10341.	12365.
2	8247.	7418.	7354.	8809.	10417.
3	2842.	3921.	4252.	4770.	5251.
4	667.	1366.	1899.	2114.	2703.
5	210.	423.	591.	1029.	1222.
6	29.	44.	172.	211.	466.
7	12.	4.	56.	90.	160.
=====					
Total	26283.	30337.	26116.	29312.	35722.

Mean Biomass

AGE	2002	2003	2004	2005	2006
0	4669.	3539.	11806.	3105.	4207.
1	10839.	12733.	9731.	13127.	5297.
2	10783.	11398.	12577.	9061.	14823.
3	6934.	8032.	7603.	8904.	7236.
4	3247.	5572.	5160.	4133.	6769.
5	1855.	2380.	3449.	2776.	2578.
6	692.	1314.	1327.	1972.	1979.
7	180.	695.	1081.	3497.	1545.
=====					
Total	39199.	45663.	52735.	46576.	44433.

Spawning Stock Biomass

AGE	1982	1983	1984	1985	1986
0	6595.	6845.	4163.	4979.	5008.
1	9178.	10188.	12372.	7959.	8221.
2	3723.	4428.	2583.	4951.	2891.
3	1488.	1954.	1319.	716.	1454.
4	698.	319.	794.	473.	165.
5	98.	23.	123.	261.	143.
6	193.	33.	7.	40.	56.
7	127.	65.	15.	14.	17.
=====					
Total	22100.	23855.	21374.	19392.	17955.
AGE	1987	1988	1989	1990	1991
0	4283.	1402.	2237.	2691.	1957.
1	9483.	5926.	2250.	4978.	4272.
2	2894.	2271.	1771.	1245.	1567.
3	1271.	723.	476.	662.	418.
4	401.	209.	96.	96.	306.
5	90.	43.	43.	16.	10.
6	56.	14.	8.	12.	6.
7	83.	19.	2.	6.	2.
=====					
Total	18560.	10609.	6882.	9706.	8537.
AGE	1992	1993	1994	1995	1996
0	3065.	3415.	4390.	5188.	3294.
1	4749.	5758.	6981.	9106.	10312.
2	1383.	1954.	2118.	3019.	4325.
3	252.	725.	965.	1035.	1297.
4	149.	88.	321.	232.	454.
5	124.	69.	27.	91.	54.
6	1.	51.	36.	8.	28.
7	1.	6.	13.	2.	6.
=====					
Total	9724.	12067.	14851.	18682.	19770.
AGE	1997	1998	1999	2000	2001
0	2647.	2909.	2090.	1561.	1916.
1	8047.	8659.	8274.	9880.	11147.
2	6626.	6178.	6516.	7175.	9077.
3	2122.	2790.	3298.	3677.	4272.
4	531.	1022.	1472.	1610.	2214.
5	101.	305.	373.	748.	970.
6	25.	33.	118.	165.	436.
7	8.	2.	38.	59.	115.
=====					
Total	20106.	21899.	22179.	24875.	30147.

Spawning Stock Biomass

AGE	2002	2003	2004	2005	2006
0	2598.	1991.	3819.	1450.	2471.
1	10522.	12056.	9105.	12854.	5302.
2	9709.	10067.	11018.	8384.	14339.
3	6276.	6793.	6099.	7930.	6378.
4	2858.	4652.	4162.	3414.	6267.
5	1671.	1940.	2868.	2392.	2205.
6	706.	1270.	1385.	2577.	2316.
7	139.	543.	828.	2732.	1229.
=====					
Total	34479.	39311.	39284.	41733.	40508.

Catch Biomass

AGE	1982	1983	1984	1985	1986
0	1357.	1182.	1191.	601.	491.
1	8119.	11860.	10526.	6259.	7764.
2	6252.	7812.	9767.	11021.	7385.
3	1353.	2345.	3326.	1960.	4387.
4	625.	871.	1244.	856.	550.
5	324.	483.	205.	579.	279.
6	179.	41.	13.	80.	192.
7	116.	112.	39.	38.	61.
=====					
Total	18325.	24706.	26312.	21393.	21110.
AGE	1987	1988	1989	1990	1991
0	294.	251.	200.	468.	145.
1	7608.	9518.	2203.	3796.	4945.
2	7056.	9087.	5282.	1771.	5018.
3	1879.	2415.	1766.	1163.	880.
4	1056.	1120.	522.	340.	393.
5	72.	301.	124.	64.	81.
6	97.	74.	22.	28.	9.
7	155.	79.	11.	13.	4.
=====					
Total	18215.	22844.	10130.	7643.	11474.
AGE	1992	1993	1994	1995	1996
0	335.	339.	581.	231.	53.
1	5263.	5460.	5471.	3130.	3532.
2	4513.	3915.	4393.	4951.	5288.
3	1375.	827.	1329.	1308.	1928.
4	210.	121.	430.	651.	644.
5	189.	84.	71.	202.	139.
6	5.	56.	48.	15.	41.
7	4.	7.	19.	4.	9.
=====					
Total	11894.	10810.	12342.	10492.	11634.
AGE	1997	1998	1999	2000	2001
0	6.	12.	26.	1.	1.
1	1150.	1094.	811.	781.	1571.
2	5141.	4134.	3718.	5513.	3646.
3	2727.	4504.	3600.	4320.	3617.
4	682.	1295.	1671.	2034.	1874.
5	360.	333.	715.	821.	779.
6	28.	49.	149.	192.	319.
7	12.	4.	49.	82.	110.
=====					
Total	10107.	11424.	10739.	13745.	11917.



Catch Biomass

AGE	2002	2003	2004	2005	2006
0	40.	39.	33.	49.	28.
1	560.	803.	544.	831.	475.
2	3982.	3747.	4189.	2572.	3463.
3	3678.	4138.	4538.	3754.	3145.
4	1785.	2417.	2571.	2616.	2268.
5	670.	1167.	1347.	1577.	1429.
6	360.	643.	716.	963.	812.
7	94.	340.	583.	1708.	682.
=====					
Total	11168.	13293.	14520.	14071.	12302.

Catch Numbers

AGE	1982	1983	1984	1985	1986
0	5344.0	4925.0	4802.0	2078.0	1942.0
1	19423.0	28441.0	26582.0	14623.0	17140.0
2	10149.0	10911.0	15454.0	17979.0	11055.0
3	935.0	2181.0	3180.0	1767.0	3782.0
4	328.0	693.0	829.0	496.0	316.0
5	116.0	323.0	95.0	252.0	140.0
6	67.0	16.0	4.0	30.0	58.0
7	30.0	43.0	10.0	8.0	15.0
=====					
Total	36392.0	47533.0	50956.0	37233.0	34448.0
AGE	1987	1988	1989	1990	1991
0	1137.0	795.0	960.0	1856.0	1001.0
1	17212.0	20557.0	4790.0	8808.0	12149.0
2	10838.0	14562.0	7306.0	2187.0	7148.0
3	1648.0	2137.0	1692.0	995.0	742.0
4	544.0	644.0	353.0	221.0	217.0
5	25.0	121.0	55.0	30.0	32.0
6	29.0	19.0	9.0	8.0	3.0
7	44.0	21.0	4.0	3.0	1.0
=====					
Total	31477.0	38856.0	15169.0	14108.0	21293.0
AGE	1992	1993	1994	1995	1996
0	1368.0	1285.0	1638.0	592.0	162.0
1	11197.0	11235.0	10362.0	5828.0	6925.0
2	6026.0	5601.0	6996.0	7303.0	9278.0
3	1125.0	566.0	982.0	1239.0	1785.0
4	151.0	73.0	205.0	397.0	417.0
5	70.0	45.0	26.0	77.0	71.0
6	2.0	20.0	14.0	4.0	16.0
7	1.0	3.0	5.0	1.0	3.0
=====					
Total	19940.0	18828.0	20228.0	15441.0	18657.0
AGE	1997	1998	1999	2000	2001
0	30.0	45.0	181.0	22.0	11.0
1	2545.0	2233.0	2185.0	1538.0	2888.0
2	8046.0	6380.0	6260.0	7967.0	4760.0
3	3149.0	5243.0	4018.0	4670.0	3737.0
4	553.0	980.0	1161.0	1529.0	1293.0
5	160.0	138.0	358.0	370.0	363.0
6	11.0	19.0	55.0	74.0	123.0
7	4.0	1.0	14.0	29.0	33.0
=====					
Total	14498.0	15039.0	14232.0	16199.0	13208.0

Catch Numbers

AGE	2002	2003	2004	2005	2006
0	272.0	259.0	107.0	245.0	191.0
1	1135.0	1583.0	1053.0	1936.0	1072.0
2	5411.0	4937.0	5668.0	3717.0	5070.0
3	3839.0	4002.0	4688.0	4045.0	3276.0
4	1302.0	1579.0	1907.0	2206.0	1796.0
5	319.0	563.0	769.0	1049.0	869.0
6	135.0	233.0	304.0	510.0	372.0
7	25.0	86.0	156.0	470.0	180.0
=====					
Total	12438.0	13242.0	14652.0	14178.0	12826.0

Surplus Production

Average Adjustment Factor (Delta) = 1.0000

Year	Biomass	Delta Biomass	Catch Biomass	Surplus Production
1982	27044.244	5544.020	18325.256	23869.276
1983	32588.264	1790.651	24705.643	26496.294
1984	34378.915	-6642.992	26311.969	19668.977
1985	27735.923	-683.298	21392.794	20709.496
1986	27052.624	-1089.676	21109.693	20020.017
1987	25962.949	-545.437	18215.288	17669.851
1988	25417.512	-13571.657	22844.063	9272.406
1989	11845.855	-1372.765	10129.975	8757.210
1990	10473.090	3671.898	7642.899	11314.797
1991	14144.988	-2205.229	11473.644	9268.415
1992	11939.759	2825.649	11893.667	14719.316
1993	14765.408	2955.978	10809.985	13765.963
1994	17721.386	3969.841	12342.219	16312.060
1995	21691.227	5152.681	10492.420	15645.101
1996	26843.909	-1817.382	11634.385	9817.003
1997	25026.527	-29.288	10107.389	10078.101
1998	24997.239	1624.348	11423.908	13048.256
1999	26621.587	146.933	10739.415	10886.348
2000	26768.520	1587.579	13744.550	15332.129
2001	28356.098	5451.901	11917.151	17369.052
2002	33807.999	6482.626	11167.880	17650.506
2003	40290.625	2676.324	13293.127	15969.451
2004	42966.949	6924.880	14520.135	21445.015
2005	49891.829	-8069.711	14070.761	6001.050
2006	41822.118	4151.659	12302.217	16453.876
2007	45973.776			

Summary of Survey Indices Used in the Estimate

INDEX	Survey Tag	Age	Time	Type	Catchability	Std. Error	CV
1	NEC_W	1	JAN-1	NUMBER	0.1420E-03	0.2696E-04	0.1899E+00
2	NEC_W	2	JAN-1	NUMBER	0.4165E-03	0.4567E-04	0.1097E+00
3	NEC_W	3	JAN-1	NUMBER	0.3412E-03	0.4563E-04	0.1337E+00
4	NEC_W	4	JAN-1	NUMBER	0.3376E-03	0.6751E-04	0.2000E+00
5	NEC_W	5 - 7	JAN-1	NUMBER	0.4480E-03	0.7427E-04	
0.1658E+00							
6	NEC_S	1	JAN-1	NUMBER	0.1382E-04	0.1966E-05	0.1423E+00
7	NEC_S	2	JAN-1	NUMBER	0.3792E-04	0.3796E-05	0.1001E+00
8	NEC_S	3	JAN-1	NUMBER	0.3442E-04	0.5555E-05	0.1614E+00
9	NEC_S	4	JAN-1	NUMBER	0.3840E-04	0.4764E-05	0.1241E+00
10	NEC_S	5 - 7	JAN-1	NUMBER	0.6527E-04	0.8139E-05	
0.1247E+00							
11	NEC_F	2	JAN-1	NUMBER	0.6761E-04	0.4435E-05	0.6560E-01
12	NEC_F	3	JAN-1	NUMBER	0.8110E-04	0.1039E-04	0.1281E+00
13	NEC_F	4	JAN-1	NUMBER	0.7563E-04	0.1069E-04	0.1413E+00
15	MA_S	2	JAN-1	NUMBER	0.4066E-04	0.7665E-05	0.1885E+00
16	MA_S	3	JAN-1	NUMBER	0.4324E-04	0.7101E-05	0.1642E+00
18	MA_F	3	JAN-1	NUMBER	0.1682E-03	0.1785E-04	0.1061E+00
19	MA_F	4	JAN-1	NUMBER	0.6573E-04	0.1295E-04	0.1970E+00
21	CT_S	2	JAN-1	NUMBER	0.1735E-04	0.2786E-05	0.1606E+00
22	CT_S	3	JAN-1	NUMBER	0.1847E-04	0.2841E-05	0.1539E+00
23	CT_S	4	JAN-1	NUMBER	0.2959E-04	0.5606E-05	0.1894E+00
24	CT_F	2	JAN-1	NUMBER	0.4258E-04	0.6790E-05	0.1595E+00
25	CT_F	3	JAN-1	NUMBER	0.1078E-03	0.1382E-04	0.1282E+00
26	CT_F	4	JAN-1	NUMBER	0.8821E-04	0.1220E-04	0.1383E+00
27	CT_F	5 - 7	JAN-1	NUMBER	0.6061E-04	0.1057E-04	
0.1743E+00							
29	RI_F	3	JAN-1	NUMBER	0.1115E-03	0.1700E-04	0.1525E+00
30	RI_F	4	JAN-1	NUMBER	0.8545E-04	0.1805E-04	0.2112E+00
31	RI_X	1	JAN-1	NUMBER	0.1045E-04	0.2173E-05	0.2080E+00
32	RI_X	2 - 7	JAN-1	NUMBER	0.2095E-04	0.3534E-05	
0.1687E+00							
33	NJ	1	JAN-1	NUMBER	0.1582E-03	0.2363E-04	0.1493E+00
34	NJ	2	JAN-1	NUMBER	0.6880E-04	0.1540E-04	0.2238E+00
35	NJ	3	JAN-1	NUMBER	0.4369E-04	0.8036E-05	0.1839E+00
36	NJ	4 - 7	JAN-1	NUMBER	0.5884E-04	0.1018E-04	
0.1730E+00							
40	CT_Y	0	JAN-1	NUMBER	0.1846E-05	0.3986E-06	0.2160E+00
41	VA_CRY	0	JAN-1	NUMBER	0.2820E-04	0.3220E-05	0.1142E+00
43	MD_Y	0	JAN-1	NUMBER	0.2388E-03	0.3044E-04	0.1275E+00
44	NJ_Y	0	JAN-1	NUMBER	0.3928E-04	0.5839E-05	0.1487E+00
45	NEC_Y	0	JAN-1	NUMBER	0.8183E-05	0.1233E-05	0.1507E+00
50	DE_IY	0	JAN-1	NUMBER	0.5487E-05	0.1072E-05	0.1954E+00
51	RI_XY	0	JAN-1	NUMBER	0.1057E-05	0.2145E-06	0.2028E+00

Survey Index: 1 Tag: NEC\_W AGE = 1  
 Time = JAN-1 Type = NUMBER  
 Catchability = 0.141956E-03 % Variance Contribution = 2.0475  
 Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual
1982	N/A	0.598569E+01	N/A
1983	N/A	0.777287E+01	N/A
1984	N/A	0.853730E+01	N/A
1985	N/A	0.491096E+01	N/A
1986	N/A	0.527415E+01	N/A
1987	N/A	0.582907E+01	N/A
1988	N/A	0.485400E+01	N/A
1989	N/A	0.138973E+01	N/A
1990	N/A	0.298243E+01	N/A
1991	N/A	0.322155E+01	N/A
1992	0.715000E+01	0.314747E+01	0.820512E+00
1993	0.650000E+01	0.351828E+01	0.613829E+00
1994	0.376000E+01	0.363184E+01	0.346795E-01
1995	0.607000E+01	0.383134E+01	0.460143E+00
1996	0.221700E+02	0.436362E+01	0.162544E+01
1997	0.386000E+01	0.322818E+01	0.178748E+00
1998	0.168000E+01	0.334148E+01	-0.687619E+00
1999	0.211000E+01	0.358412E+01	-0.529825E+00
2000	0.700000E+00	0.330610E+01	-0.155244E+01
2001	0.307000E+01	0.378308E+01	-0.208860E+00
2002	0.277000E+01	0.353003E+01	-0.242458E+00
2003	0.817000E+01	0.405456E+01	0.700627E+00
2004	0.145000E+01	0.302842E+01	-0.736479E+00
2005	0.296000E+01	0.494054E+01	-0.512284E+00
2006	0.264000E+01	0.195512E+01	0.300327E+00
2007	0.277000E+01	0.360810E+01	-0.264333E+00

Survey Index: 2 Tag: NEC\_W AGE = 2  
 Time = JAN-1 Type = NUMBER  
 Catchability = 0.416467E-03 % Variance Contribution = 0.6825  
 Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual
1982	N/A	0.661760E+01	N/A
1983	N/A	0.715387E+01	N/A
1984	N/A	0.811568E+01	N/A
1985	N/A	0.106140E+02	N/A
1986	N/A	0.635063E+01	N/A
1987	N/A	0.629400E+01	N/A
1988	N/A	0.759106E+01	N/A
1989	N/A	0.405717E+01	N/A
1990	N/A	0.155847E+01	N/A
1991	N/A	0.388338E+01	N/A
1992	0.474000E+01	0.323239E+01	0.382815E+00
1993	0.670000E+01	0.340259E+01	0.677570E+00

1994	0.720000E+01	0.427136E+01	0.522148E+00
1995	0.459000E+01	0.486275E+01	-0.577246E-01
1996	0.833000E+01	0.702008E+01	0.171089E+00
1997	0.480000E+01	0.788832E+01	-0.496768E+00
1998	0.325000E+01	0.679865E+01	-0.738069E+00
1999	0.480000E+01	0.718760E+01	-0.403742E+00
2000	0.652000E+01	0.778831E+01	-0.177749E+00
2001	0.533000E+01	0.736328E+01	-0.323154E+00
2002	0.107400E+02	0.800265E+01	0.294202E+00
2003	0.143600E+02	0.805239E+01	0.578477E+00
2004	0.868000E+01	0.914402E+01	-0.520787E-01
2005	0.403000E+01	0.687841E+01	-0.534621E+00
2006	0.906000E+01	0.111395E+02	-0.206624E+00
2007	0.618000E+01	0.429345E+01	0.364228E+00

Survey Index: 3 Tag: NEC\_W AGE = 3  
Time = JAN-1 Type = NUMBER  
Catchability = 0.341157E-03 % Variance Contribution = 1.0150  
Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual
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1982	N/A	0.737683E+00	N/A
1983	N/A	0.136957E+01	N/A
1984	N/A	0.149823E+01	N/A
1985	N/A	0.819107E+00	N/A
1986	N/A	0.170322E+01	N/A
1987	N/A	0.933731E+00	N/A
1988	N/A	0.959302E+00	N/A
1989	N/A	0.736510E+00	N/A
1990	N/A	0.527252E+00	N/A
1991	N/A	0.382213E+00	N/A
1992	0.330000E+00	0.460926E+00	-0.334145E+00
1993	0.310000E+00	0.362255E+00	-0.155775E+00
1994	0.820000E+00	0.592924E+00	0.324238E+00
1995	0.250000E+00	0.754462E+00	-0.110454E+01
1996	0.600000E+00	0.105167E+01	-0.561201E+00
1997	0.104000E+01	0.189128E+01	-0.598034E+00
1998	0.229000E+01	0.283631E+01	-0.213951E+00
1999	0.290000E+01	0.261156E+01	0.104763E+00
2000	0.496000E+01	0.290745E+01	0.534129E+00
2001	0.642000E+01	0.279342E+01	0.832150E+00
2002	0.558000E+01	0.347996E+01	0.472167E+00
2003	0.848000E+01	0.370984E+01	0.826721E+00
2004	0.456000E+01	0.388738E+01	0.159588E+00
2005	0.307000E+01	0.439558E+01	-0.358922E+00
2006	0.429000E+01	0.347310E+01	0.211240E+00
2007	0.515000E+01	0.591459E+01	-0.138425E+00

Survey Index: 4 Tag: NEC\_W AGE = 4  
Time = JAN-1 Type = NUMBER  
Catchability = 0.337567E-03 % Variance Contribution = 2.2698  
Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual
1982	N/A	0.263309E+00	N/A
1983	N/A	0.315483E+00	N/A
1984	N/A	0.454103E+00	N/A
1985	N/A	0.267158E+00	N/A
1986	N/A	0.138030E+00	N/A
1987	N/A	0.256767E+00	N/A
1988	N/A	0.262477E+00	N/A
1989	N/A	0.142701E+00	N/A
1990	N/A	0.953159E-01	N/A
1991	N/A	0.129526E+00	N/A
1992	0.400000E-01	0.879242E-01	-0.787596E+00
1993	0.500000E-01	0.416751E-01	0.182118E+00
1994	0.260000E+00	0.123309E+00	0.745987E+00
1995	0.200000E-01	0.185508E+00	-0.222737E+01
1996	0.120000E+00	0.239137E+00	-0.689543E+00
1997	0.430000E+00	0.316386E+00	0.306821E+00
1998	0.420000E+00	0.586846E+00	-0.334508E+00
1999	0.840000E+00	0.728459E+00	0.142470E+00
2000	0.251000E+01	0.907322E+00	0.101754E+01
2001	0.244000E+01	0.952268E+00	0.940907E+00
2002	0.226000E+01	0.113631E+01	0.687579E+00
2003	0.267000E+01	0.165875E+01	0.476015E+00
2004	0.164000E+01	0.179541E+01	-0.905359E-01
2005	0.134000E+01	0.173371E+01	-0.257592E+00
2006	0.247000E+01	0.233605E+01	0.557554E-01
2007	0.154000E+01	0.182181E+01	-0.168048E+00

Survey Index: 5 Tag: NEC\_W AGE = 5 - 7  
Time = JAN-1 Type = NUMBER  
Catchability = 0.447993E-03 % Variance Contribution = 1.3646  
Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual
1982	N/A	0.168212E+00	N/A
1983	N/A	0.198627E+00	N/A
1984	N/A	0.783709E-01	N/A
1985	N/A	0.187970E+00	N/A
1986	N/A	0.136512E+00	N/A
1987	N/A	0.780604E-01	N/A
1988	N/A	0.870151E-01	N/A
1989	N/A	0.404212E-01	N/A
1990	N/A	0.243346E-01	N/A
1991	N/A	0.194429E-01	N/A
1992	0.400000E-01	0.560117E-01	-0.336682E+00
1993	0.400000E-01	0.544552E-01	-0.308499E+00
1994	0.100000E-01	0.312442E-01	-0.113925E+01
1995	N/A	0.560531E-01	N/A
1996	0.300000E-01	0.592879E-01	-0.681208E+00
1997	0.150000E+00	0.105502E+00	0.351905E+00
1998	0.120000E+00	0.138226E+00	-0.141402E+00
1999	0.410000E+00	0.305012E+00	0.295807E+00

2000	0.108000E+01	0.412287E+00	0.962997E+00
2001	0.134000E+01	0.530297E+00	0.926987E+00
2002	0.133000E+01	0.710651E+00	0.626753E+00
2003	0.196000E+01	0.111677E+01	0.562500E+00
2004	0.144000E+01	0.170866E+01	-0.171066E+00
2005	0.149000E+01	0.242867E+01	-0.488567E+00
2006	0.258000E+01	0.179781E+01	0.361219E+00
2007	0.119000E+01	0.270594E+01	-0.821496E+00

Survey Index: 6 Tag: NEC\_S AGE = 1  
Time = JAN-1 Type = NUMBER  
Catchability = 0.138176E-04 % Variance Contribution = 3.1103  
Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual
1982	0.700000E+00	0.582628E+00	0.183531E+00
1983	0.320000E+00	0.756587E+00	-0.860497E+00
1984	0.170000E+00	0.830994E+00	-0.158682E+01
1985	0.550000E+00	0.478018E+00	0.140270E+00
1986	0.148000E+01	0.513370E+00	0.105880E+01
1987	0.470000E+00	0.567384E+00	-0.188303E+00
1988	0.600000E+00	0.472474E+00	0.238948E+00
1989	0.600000E-01	0.135272E+00	-0.812943E+00
1990	0.630000E+00	0.290300E+00	0.774804E+00
1991	0.790000E+00	0.313575E+00	0.923993E+00
1992	0.770000E+00	0.306365E+00	0.921612E+00
1993	0.730000E+00	0.342459E+00	0.756893E+00
1994	0.350000E+00	0.353512E+00	-0.998476E-02
1995	0.790000E+00	0.372931E+00	0.750639E+00
1996	0.108000E+01	0.424742E+00	0.933235E+00
1997	0.290000E+00	0.314221E+00	-0.802170E-01
1998	0.270000E+00	0.325249E+00	-0.186170E+00
1999	0.220000E+00	0.348867E+00	-0.461064E+00
2000	0.190000E+00	0.321806E+00	-0.526923E+00
2001	0.480000E+00	0.368233E+00	0.265070E+00
2002	0.340000E+00	0.343602E+00	-0.105380E-01
2003	0.540000E+00	0.394658E+00	0.313549E+00
2004	0.300000E+00	0.294777E+00	0.175616E-01
2005	0.260000E+00	0.480897E+00	-0.614971E+00
2006	0.400000E-01	0.190305E+00	-0.155975E+01
2007	0.240000E+00	0.351201E+00	-0.380720E+00

Survey Index: 7 Tag: NEC\_S AGE = 2  
Time = JAN-1 Type = NUMBER  
Catchability = 0.379163E-04 % Variance Contribution = 1.5403  
Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual
1982	0.143000E+01	0.602485E+00	0.864367E+00
1983	0.390000E+00	0.651308E+00	-0.512836E+00
1984	0.330000E+00	0.738874E+00	-0.806035E+00



1985	0.156000E+01	0.966324E+00	0.478942E+00
1986	0.430000E+00	0.578179E+00	-0.296098E+00
1987	0.430000E+00	0.573023E+00	-0.287141E+00
1988	0.810000E+00	0.691111E+00	0.158733E+00
1989	0.230000E+00	0.369376E+00	-0.473735E+00
1990	0.300000E-01	0.141888E+00	-0.155384E+01
1991	0.270000E+00	0.353554E+00	-0.269615E+00
1992	0.410000E+00	0.294286E+00	0.331606E+00
1993	0.500000E+00	0.309782E+00	0.478741E+00
1994	0.530000E+00	0.388877E+00	0.309614E+00
1995	0.270000E+00	0.442719E+00	-0.494512E+00
1996	0.560000E+00	0.639127E+00	-0.132167E+00
1997	0.670000E+00	0.718175E+00	-0.694357E-01
1998	0.520000E+00	0.618968E+00	-0.174224E+00
1999	0.740000E+00	0.654379E+00	0.122963E+00
2000	0.103000E+01	0.709069E+00	0.373361E+00
2001	0.890000E+00	0.670373E+00	0.283387E+00
2002	0.890000E+00	0.728584E+00	0.200119E+00
2003	0.129000E+01	0.733112E+00	0.565099E+00
2004	0.145000E+01	0.832497E+00	0.554889E+00
2005	0.650000E+00	0.626230E+00	0.372553E-01
2006	0.104000E+01	0.101417E+01	0.251533E-01
2007	0.520000E+00	0.390888E+00	0.285409E+00

Survey Index: 8 Tag: NEC\_S AGE = 3  
Time = JAN-1 Type = NUMBER  
Catchability = 0.344239E-04 % Variance Contribution = 3.6939  
Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual
1982	0.120000E+00	0.744349E-01	0.477567E+00
1983	0.190000E+00	0.138195E+00	0.318360E+00
1984	0.900000E-01	0.151176E+00	-0.518638E+00
1985	0.210000E+00	0.826507E-01	0.932484E+00
1986	0.200000E+00	0.171860E+00	0.151635E+00
1987	0.200000E-01	0.942168E-01	-0.154987E+01
1988	0.700000E-01	0.967969E-01	-0.324120E+00
1989	0.200000E-01	0.743165E-01	-0.131260E+01
1990	0.600000E-01	0.532016E-01	0.120257E+00
1991	N/A	0.385666E-01	N/A
1992	0.100000E-01	0.465091E-01	-0.153706E+01
1993	0.400000E-01	0.365528E-01	0.901224E-01
1994	0.400000E-01	0.598281E-01	-0.402597E+00
1995	0.200000E-01	0.761279E-01	-0.133668E+01
1996	0.120000E+00	0.106117E+00	0.122951E+00
1997	0.900000E-01	0.190837E+00	-0.751609E+00
1998	0.320000E+00	0.286193E+00	0.111653E+00
1999	0.480000E+00	0.263515E+00	0.599674E+00
2000	0.630000E+00	0.293372E+00	0.764278E+00
2001	0.102000E+01	0.281866E+00	0.128613E+01
2002	0.740000E+00	0.351140E+00	0.745464E+00
2003	0.590000E+00	0.374336E+00	0.454968E+00
2004	0.850000E+00	0.392250E+00	0.773337E+00
2005	0.580000E+00	0.443529E+00	0.268264E+00

2006	0.240000E+00	0.350448E+00	-0.378572E+00
2007	0.146000E+01	0.596803E+00	0.894605E+00

Survey Index: 9 Tag: NEC\_S AGE = 4  
Time = JAN-1 Type = NUMBER  
Catchability = 0.383975E-04 % Variance Contribution = 1.5288  
Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual
1982	0.200000E-01	0.299508E-01	-0.403824E+00
1983	0.300000E-01	0.358854E-01	-0.179133E+00
1984	0.500000E-01	0.516531E-01	-0.325277E-01
1985	0.400000E-01	0.303886E-01	0.274811E+00
1986	0.200000E-01	0.157005E-01	0.242037E+00
1987	0.100000E-01	0.292066E-01	-0.107181E+01
1988	0.200000E-01	0.298561E-01	-0.400658E+00
1989	0.100000E-01	0.162319E-01	-0.484396E+00
1990	N/A	0.108420E-01	N/A
1991	0.200000E-01	0.147333E-01	0.305621E+00
1992	N/A	0.100012E-01	N/A
1993	N/A	0.474045E-02	N/A
1994	0.100000E-01	0.140261E-01	-0.338337E+00
1995	N/A	0.211011E-01	N/A
1996	N/A	0.272012E-01	N/A
1997	0.100000E-01	0.359882E-01	-0.128061E+01
1998	0.600000E-01	0.667524E-01	-0.106645E+00
1999	0.130000E+00	0.828605E-01	0.450376E+00
2000	0.120000E+00	0.103206E+00	0.150767E+00
2001	0.200000E+00	0.108318E+00	0.613244E+00
2002	0.310000E+00	0.129253E+00	0.874804E+00
2003	0.290000E+00	0.188679E+00	0.429836E+00
2004	0.270000E+00	0.204223E+00	0.279208E+00
2005	0.150000E+00	0.197205E+00	-0.273608E+00
2006	0.250000E+00	0.265720E+00	-0.609837E-01
2007	0.570000E+00	0.207227E+00	0.101182E+01

Survey Index: 10 Tag: NEC\_S AGE = 5 - 7  
Time = JAN-1 Type = NUMBER  
Catchability = 0.652723E-04 % Variance Contribution = 0.8825  
Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual
1982	N/A	0.245084E-01	N/A
1983	0.200000E-01	0.289398E-01	-0.369487E+00
1984	0.200000E-01	0.114186E-01	0.560489E+00
1985	0.200000E-01	0.273872E-01	-0.314342E+00
1986	0.100000E-01	0.198897E-01	-0.687616E+00
1987	N/A	0.113734E-01	N/A
1988	N/A	0.126780E-01	N/A
1989	N/A	0.588935E-02	N/A
1990	N/A	0.354554E-02	N/A

1991	N/A	0.283282E-02	N/A
1992	0.100000E-01	0.816088E-02	0.203233E+00
1993	N/A	0.793409E-02	N/A
1994	N/A	0.455226E-02	N/A
1995	0.100000E-01	0.816690E-02	0.202496E+00
1996	N/A	0.863821E-02	N/A
1997	N/A	0.153716E-01	N/A
1998	0.200000E-01	0.201395E-01	-0.695188E-02
1999	0.300000E-01	0.444400E-01	-0.392943E+00
2000	0.170000E+00	0.600700E-01	0.104029E+01
2001	0.100000E+00	0.772640E-01	0.257942E+00
2002	0.190000E+00	0.103541E+00	0.607052E+00
2003	0.210000E+00	0.162713E+00	0.255117E+00
2004	0.150000E+00	0.248951E+00	-0.506620E+00
2005	0.170000E+00	0.353856E+00	-0.733091E+00
2006	0.200000E+00	0.261940E+00	-0.269798E+00
2007	0.460000E+00	0.394254E+00	0.154231E+00

Survey Index: 11 Tag: NEC\_F AGE = 2  
Time = JAN-1 Type = NUMBER  
Catchability = 0.676126E-04 % Variance Contribution = 0.6105  
Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual
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1982	N/A	0.107435E+01	N/A
1983	0.152000E+01	0.116142E+01	0.269071E+00
1984	0.146000E+01	0.131756E+01	0.102652E+00
1985	0.139000E+01	0.172315E+01	-0.214852E+00
1986	0.800000E+00	0.103101E+01	-0.253684E+00
1987	0.830000E+00	0.102182E+01	-0.207913E+00
1988	0.580000E+00	0.123239E+01	-0.753685E+00
1989	0.620000E+00	0.658673E+00	-0.605070E-01
1990	0.210000E+00	0.253015E+00	-0.186340E+00
1991	0.380000E+00	0.630459E+00	-0.506278E+00
1992	0.840000E+00	0.524772E+00	0.470438E+00
1993	0.104000E+01	0.552404E+00	0.632696E+00
1994	0.800000E+00	0.693447E+00	0.142937E+00
1995	0.670000E+00	0.789458E+00	-0.164069E+00
1996	0.116000E+01	0.113969E+01	0.176594E-01
1997	0.124000E+01	0.128065E+01	-0.322590E-01
1998	0.129000E+01	0.110375E+01	0.155932E+00
1999	0.213000E+01	0.116689E+01	0.601778E+00
2000	0.173000E+01	0.126442E+01	0.313511E+00
2001	0.120000E+01	0.119541E+01	0.383002E-02
2002	0.136000E+01	0.129921E+01	0.457252E-01
2003	0.117000E+01	0.130729E+01	-0.110952E+00
2004	0.131000E+01	0.148451E+01	-0.125060E+00
2005	0.149000E+01	0.111670E+01	0.288402E+00
2006	0.114000E+01	0.180847E+01	-0.461451E+00
2007	0.720000E+00	0.697033E+00	0.324187E-01

Survey Index: 12 Tag: NEC\_F AGE = 3  
Time = JAN-1 Type = NUMBER  
Catchability = 0.811036E-04 % Variance Contribution = 2.3297

Residual = LN(Observed) - LN(Predicted)

Year            Observed            Predicted            Residual

1982	N/A	0.175370E+00	N/A
1983	0.400000E+00	0.325590E+00	0.205825E+00
1984	0.340000E+00	0.356175E+00	-0.464772E-01
1985	0.430000E+00	0.194727E+00	0.792186E+00
1986	0.460000E+00	0.404907E+00	0.127569E+00
1987	0.110000E+00	0.221977E+00	-0.702093E+00
1988	0.200000E+00	0.228056E+00	-0.131273E+00
1989	0.180000E+00	0.175091E+00	0.276487E-01
1990	0.500000E-01	0.125344E+00	-0.919040E+00
1991	0.300000E-01	0.908638E-01	-0.110816E+01
1992	0.900000E-01	0.109576E+00	-0.196813E+00
1993	0.250000E+00	0.861192E-01	0.106573E+01
1994	0.300000E-01	0.140956E+00	-0.154725E+01
1995	0.900000E-01	0.179359E+00	-0.689580E+00
1996	0.280000E+00	0.250014E+00	0.113274E+00
1997	0.570000E+00	0.449616E+00	0.237242E+00
1998	0.114000E+01	0.674278E+00	0.525141E+00
1999	0.163000E+01	0.620849E+00	0.965248E+00
2000	0.149000E+01	0.691191E+00	0.768115E+00
2001	0.122000E+01	0.664083E+00	0.608199E+00
2002	0.930000E+00	0.827295E+00	0.117023E+00
2003	0.860000E+00	0.881945E+00	-0.251973E-01
2004	0.103000E+01	0.924150E+00	0.108440E+00
2005	0.137000E+01	0.104497E+01	0.270827E+00
2006	0.540000E+00	0.825663E+00	-0.424617E+00
2007	0.122000E+01	0.140608E+01	-0.141956E+00

Survey Index:    13 Tag:                    NEC\_F    AGE =    4  
 Time = JAN-1                            Type = NUMBER  
 Catchability =    0.756270E-04    % Variance Contribution =    2.3884  
 Residual = LN(Observed) - LN(Predicted)

Year            Observed            Predicted            Residual

1982	N/A	0.589906E-01	N/A
1983	0.300000E-01	0.706794E-01	-0.856956E+00
1984	0.120000E+00	0.101735E+00	0.165118E+00
1985	0.700000E-01	0.598530E-01	0.156604E+00
1986	0.500000E-01	0.309235E-01	0.480505E+00
1987	0.110000E+00	0.575249E-01	0.648263E+00
1988	0.300000E-01	0.588042E-01	-0.673016E+00
1989	0.300000E-01	0.319702E-01	-0.636069E-01
1990	N/A	0.213541E-01	N/A
1991	0.400000E-01	0.290185E-01	0.320945E+00
1992	N/A	0.196981E-01	N/A
1993	0.300000E-01	0.933671E-02	0.116724E+01
1994	0.100000E-01	0.276256E-01	-0.101616E+01
1995	0.100000E-01	0.415605E-01	-0.142456E+01
1996	0.200000E-01	0.535751E-01	-0.985352E+00
1997	0.400000E-01	0.708818E-01	-0.572134E+00

1998	0.290000E+00	0.131474E+00	0.791068E+00
1999	0.330000E+00	0.163201E+00	0.704111E+00
2000	0.310000E+00	0.203272E+00	0.422025E+00
2001	0.400000E+00	0.213342E+00	0.628569E+00
2002	0.370000E+00	0.254574E+00	0.373912E+00
2003	0.350000E+00	0.371619E+00	-0.599349E-01
2004	0.250000E+00	0.402235E+00	-0.475576E+00
2005	0.660000E+00	0.388412E+00	0.530174E+00
2006	0.470000E+00	0.523359E+00	-0.107535E+00
2007	0.350000E+00	0.408150E+00	-0.153702E+00

Survey Index: 15 Tag: MA\_S AGE = 2  
Time = JAN-1 Type = NUMBER  
Catchability = 0.406577E-04 % Variance Contribution = 5.0423  
Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual
1982	0.158400E+01	0.646045E+00	0.896840E+00
1983	0.599000E+00	0.698398E+00	-0.153527E+00
1984	0.780000E-01	0.792295E+00	-0.231822E+01
1985	0.126000E+01	0.103619E+01	0.195562E+00
1986	0.522000E+00	0.619981E+00	-0.172022E+00
1987	0.640000E+00	0.614453E+00	0.407355E-01
1988	0.100500E+01	0.741079E+00	0.304636E+00
1989	0.363000E+00	0.396082E+00	-0.872174E-01
1990	0.210000E-01	0.152146E+00	-0.198032E+01
1991	0.500000E-01	0.379116E+00	-0.202582E+01
1992	0.342000E+00	0.315563E+00	0.804533E-01
1993	0.492000E+00	0.332179E+00	0.392805E+00
1994	0.121700E+01	0.416993E+00	0.107108E+01
1995	0.130200E+01	0.474727E+00	0.100892E+01
1996	0.686000E+00	0.685336E+00	0.967934E-03
1997	0.127900E+01	0.770099E+00	0.507314E+00
1998	0.121200E+01	0.663719E+00	0.602168E+00
1999	0.878000E+00	0.701691E+00	0.224153E+00
2000	0.165900E+01	0.760335E+00	0.780211E+00
2001	0.102600E+01	0.718841E+00	0.355782E+00
2002	0.151100E+01	0.781260E+00	0.659618E+00
2003	0.144000E+01	0.786116E+00	0.605294E+00
2004	0.283000E+00	0.892687E+00	-0.114879E+01
2005	0.351000E+00	0.671506E+00	-0.648737E+00
2006	0.244000E+01	0.108749E+01	0.808125E+00
2007	N/A	0.419149E+00	N/A

Survey Index: 16 Tag: MA\_S AGE = 3  
Time = JAN-1 Type = NUMBER  
Catchability = 0.432367E-04 % Variance Contribution = 3.8271  
Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual
1982	0.142000E+00	0.934907E-01	0.417965E+00

1983	0.450000E+00	0.173574E+00	0.952646E+00
1984	0.670000E-01	0.189879E+00	-0.104169E+01
1985	0.360000E-01	0.103810E+00	-0.105904E+01
1986	0.185000E+00	0.215858E+00	-0.154264E+00
1987	0.130000E-01	0.118337E+00	-0.220859E+01
1988	0.123000E+00	0.121578E+00	0.116315E-01
1989	0.102000E+00	0.933420E-01	0.887022E-01
1990	0.810000E-01	0.668215E-01	0.192424E+00
1991	0.120000E-01	0.484399E-01	-0.139542E+01
1992	0.900000E-01	0.584157E-01	0.432225E+00
1993	0.650000E-01	0.459105E-01	0.347693E+00
1994	0.480000E-01	0.751446E-01	-0.448213E+00
1995	0.530000E-01	0.956171E-01	-0.590060E+00
1996	0.114000E+00	0.133283E+00	-0.156280E+00
1997	0.181000E+00	0.239692E+00	-0.280860E+00
1998	0.659000E+00	0.359461E+00	0.606118E+00
1999	0.111200E+01	0.330977E+00	0.121187E+01
2000	0.120500E+01	0.368477E+00	0.118486E+01
2001	0.730000E+00	0.354026E+00	0.723674E+00
2002	0.397000E+00	0.441035E+00	-0.105188E+00
2003	0.624000E+00	0.470169E+00	0.283058E+00
2004	0.323000E+00	0.492669E+00	-0.422184E+00
2005	0.102900E+01	0.557076E+00	0.613641E+00
2006	0.975000E+00	0.440165E+00	0.795289E+00
2007	N/A	0.749589E+00	N/A

Survey Index: 18 Tag: MA\_F AGE = 3  
Time = JAN-1 Type = NUMBER  
Catchability = 0.168215E-03 % Variance Contribution = 1.5980  
Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual
1982	0.405000E+00	0.363731E+00	0.107472E+00
1983	0.166200E+01	0.675298E+00	0.900622E+00
1984	0.625000E+00	0.738734E+00	-0.167187E+00
1985	0.267000E+00	0.403879E+00	-0.413866E+00
1986	0.189500E+01	0.839808E+00	0.813801E+00
1987	0.679000E+00	0.460397E+00	0.388532E+00
1988	0.663000E+00	0.473005E+00	0.337669E+00
1989	0.429000E+00	0.363153E+00	0.166633E+00
1990	0.317000E+00	0.259973E+00	0.198323E+00
1991	N/A	0.188458E+00	N/A
1992	0.288000E+00	0.227270E+00	0.236822E+00
1993	0.186000E+00	0.178618E+00	0.404988E-01
1994	0.478000E+00	0.292354E+00	0.491644E+00
1995	0.760000E-01	0.372004E+00	-0.158817E+01
1996	0.506000E+00	0.518547E+00	-0.244945E-01
1997	0.128200E+01	0.932538E+00	0.318267E+00
1998	0.150800E+01	0.139850E+01	0.753813E-01
1999	0.590000E+00	0.128769E+01	-0.780480E+00
2000	0.940000E+00	0.143358E+01	-0.422052E+00
2001	0.230300E+01	0.137736E+01	0.514045E+00
2002	0.108300E+01	0.171587E+01	-0.460187E+00
2003	0.130200E+01	0.182922E+01	-0.339988E+00

2004	0.125400E+01	0.191676E+01	-0.424296E+00
2005	0.145500E+01	0.216734E+01	-0.398494E+00
2006	0.204900E+01	0.171249E+01	0.179405E+00
2007	0.374500E+01	0.291632E+01	0.250099E+00

Survey Index: 19 Tag: MA\_F AGE = 4  
Time = JAN-1 Type = NUMBER  
Catchability = 0.657295E-04 % Variance Contribution = 4.6457  
Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual
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1982	0.120000E-01	0.512704E-01	-0.145221E+01
1983	0.200000E-01	0.614294E-01	-0.112216E+01
1984	0.154000E+00	0.884208E-01	0.554845E+00
1985	0.127000E+00	0.520198E-01	0.892562E+00
1986	0.400000E-01	0.268765E-01	0.397627E+00
1987	0.214000E+00	0.499964E-01	0.145402E+01
1988	0.110000E-01	0.511083E-01	-0.153605E+01
1989	0.600000E-02	0.277862E-01	-0.153278E+01
1990	0.160000E-01	0.185595E-01	-0.148392E+00
1991	0.110000E-01	0.252208E-01	-0.829773E+00
1992	0.600000E-02	0.171202E-01	-0.104850E+01
1993	N/A	0.811479E-02	N/A
1994	0.300000E-01	0.240102E-01	0.222719E+00
1995	N/A	0.361214E-01	N/A
1996	N/A	0.465636E-01	N/A
1997	0.114000E+00	0.616053E-01	0.615451E+00
1998	0.351000E+00	0.114268E+00	0.112224E+01
1999	0.262000E+00	0.141842E+00	0.613629E+00
2000	0.379000E+00	0.176670E+00	0.763255E+00
2001	0.494000E+00	0.185421E+00	0.979905E+00
2002	0.307000E+00	0.221257E+00	0.327523E+00
2003	0.178000E+00	0.322984E+00	-0.595819E+00
2004	0.256000E+00	0.349594E+00	-0.311594E+00
2005	0.136000E+00	0.337579E+00	-0.909146E+00
2006	0.135000E+01	0.454865E+00	0.108786E+01
2007	0.559000E+00	0.354735E+00	0.454780E+00

Survey Index: 21 Tag: CT\_S AGE = 2  
Time = JAN-1 Type = NUMBER  
Catchability = 0.173459E-04 % Variance Contribution = 3.0870  
Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual
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1982	N/A	0.275624E+00	N/A
1983	N/A	0.297959E+00	N/A
1984	0.271000E+00	0.338019E+00	-0.220982E+00
1985	0.325000E+00	0.442072E+00	-0.307647E+00
1986	0.100000E+00	0.264504E+00	-0.972686E+00
1987	0.860000E-01	0.262146E+00	-0.111455E+01
1988	0.223000E+00	0.316168E+00	-0.349102E+00

1989	0.490000E-01	0.168981E+00	-0.123797E+01
1990	0.220000E-01	0.649105E-01	-0.108197E+01
1991	0.189000E+00	0.161743E+00	0.155737E+00
1992	0.188000E+00	0.134629E+00	0.333917E+00
1993	0.151000E+00	0.141718E+00	0.634391E-01
1994	0.314000E+00	0.177903E+00	0.568157E+00
1995	0.510000E-01	0.202534E+00	-0.137908E+01
1996	0.266000E+00	0.292387E+00	-0.945805E-01
1997	0.507000E+00	0.328549E+00	0.433824E+00
1998	0.594000E+00	0.283164E+00	0.740853E+00
1999	0.593000E+00	0.299364E+00	0.683534E+00
2000	0.726000E+00	0.324384E+00	0.805623E+00
2001	0.340000E+00	0.306681E+00	0.103138E+00
2002	0.126400E+01	0.333311E+00	0.133296E+01
2003	0.101600E+01	0.335383E+00	0.110836E+01
2004	0.818000E+00	0.380849E+00	0.764459E+00
2005	0.264000E+00	0.286486E+00	-0.817412E-01
2006	0.360000E+00	0.463959E+00	-0.253692E+00
2007	N/A	0.178822E+00	N/A

Survey Index: 22 Tag: CT\_S AGE = 3  
Time = JAN-1 Type = NUMBER  
Catchability = 0.184656E-04 % Variance Contribution = 2.8328  
Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual
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1982	N/A	0.399282E-01	N/A
1983	N/A	0.741301E-01	N/A
1984	0.440000E-01	0.810937E-01	-0.611415E+00
1985	0.400000E-01	0.443353E-01	-0.102902E+00
1986	0.820000E-01	0.921889E-01	-0.117121E+00
1987	0.140000E-01	0.505395E-01	-0.128370E+01
1988	0.350000E-01	0.519236E-01	-0.394425E+00
1989	0.240000E-01	0.398647E-01	-0.507436E+00
1990	0.130000E-01	0.285383E-01	-0.786296E+00
1991	0.290000E-01	0.206878E-01	0.337752E+00
1992	0.210000E-01	0.249483E-01	-0.172282E+00
1993	0.150000E-01	0.196075E-01	-0.267864E+00
1994	0.250000E-01	0.320929E-01	-0.249758E+00
1995	0.200000E-01	0.408363E-01	-0.713840E+00
1996	0.860000E-01	0.569229E-01	0.412649E+00
1997	0.570000E-01	0.102368E+00	-0.585525E+00
1998	0.503000E+00	0.153519E+00	0.118677E+01
1999	0.385000E+00	0.141354E+00	0.100197E+01
2000	0.524000E+00	0.157370E+00	0.120289E+01
2001	0.365000E+00	0.151198E+00	0.881308E+00
2002	0.465000E+00	0.188358E+00	0.903694E+00
2003	0.395000E+00	0.200800E+00	0.676574E+00
2004	0.410000E+00	0.210410E+00	0.667101E+00
2005	0.150000E+00	0.237917E+00	-0.461286E+00
2006	0.680000E-01	0.187986E+00	-0.101686E+01
2007	N/A	0.320135E+00	N/A

Survey Index: 23 Tag: CT\_S AGE = 4



Time = JAN-1                      Type = NUMBER  
 Catchability = 0.295921E-04    % Variance Contribution = 3.9209  
 Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual
1982	N/A	0.230824E-01	N/A
1983	N/A	0.276561E-01	N/A
1984	N/A	0.398079E-01	N/A
1985	0.580000E-01	0.234198E-01	0.906860E+00
1986	0.800000E-02	0.121001E-01	-0.413769E+00
1987	0.400000E-02	0.225089E-01	-0.172762E+01
1988	0.900000E-02	0.230095E-01	-0.938681E+00
1989	0.160000E-01	0.125096E-01	0.246092E+00
1990	0.600000E-02	0.835565E-02	-0.331179E+00
1991	0.280000E-01	0.113546E-01	0.902578E+00
1992	0.400000E-02	0.770768E-02	-0.655923E+00
1993	0.180000E-01	0.365336E-02	0.159473E+01
1994	0.180000E-01	0.108096E-01	0.509935E+00
1995	0.500000E-02	0.162622E-01	-0.117940E+01
1996	0.230000E-01	0.209634E-01	0.927172E-01
1997	0.360000E-01	0.277353E-01	0.260813E+00
1998	0.116000E+00	0.514446E-01	0.813085E+00
1999	0.139000E+00	0.638588E-01	0.777800E+00
2000	0.740000E-01	0.795384E-01	-0.721746E-01
2001	0.120000E+00	0.834784E-01	0.362903E+00
2002	0.233000E+00	0.996121E-01	0.849755E+00
2003	0.232000E+00	0.145410E+00	0.467177E+00
2004	0.194000E+00	0.157390E+00	0.209129E+00
2005	0.330000E-01	0.151981E+00	-0.152725E+01
2006	0.650000E-01	0.204785E+00	-0.114757E+01
2007	N/A	0.159705E+00	N/A

Survey Index: 24 Tag: CT\_F AGE = 2  
 Time = JAN-1                      Type = NUMBER  
 Catchability = 0.425758E-04    % Variance Contribution = 3.0428  
 Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual
1982	N/A	0.676523E+00	N/A
1983	N/A	0.731346E+00	N/A
1984	N/A	0.829673E+00	N/A
1985	0.571000E+00	0.108507E+01	-0.642013E+00
1986	0.339000E+00	0.649230E+00	-0.649787E+00
1987	0.117000E+01	0.643441E+00	0.597929E+00
1988	0.106700E+01	0.776040E+00	0.318402E+00
1989	0.884000E+00	0.414767E+00	0.756739E+00
1990	0.290000E-01	0.159324E+00	-0.170364E+01
1991	0.674000E+00	0.397002E+00	0.529290E+00
1992	0.826000E+00	0.330450E+00	0.916140E+00
1993	0.570000E+00	0.347850E+00	0.493865E+00
1994	0.827000E+00	0.436665E+00	0.638638E+00

1995	0.300000E+00	0.497123E+00	-0.505055E+00
1996	0.384000E+00	0.717668E+00	-0.625365E+00
1997	0.887000E+00	0.806430E+00	0.952279E-01
1998	0.681000E+00	0.695031E+00	-0.203946E-01
1999	0.269000E+00	0.734795E+00	-0.100488E+01
2000	0.679000E+00	0.796205E+00	-0.159236E+00
2001	0.395000E+00	0.752754E+00	-0.644852E+00
2002	0.268900E+01	0.818118E+00	0.118992E+01
2003	0.308700E+01	0.823203E+00	0.132175E+01
2004	0.145900E+01	0.934801E+00	0.445173E+00
2005	0.385000E+00	0.703186E+00	-0.602377E+00
2006	0.109300E+01	0.113880E+01	-0.410449E-01
2007	0.217000E+00	0.438923E+00	-0.704427E+00

Survey Index: 25 Tag: CT\_F AGE = 3  
Time = JAN-1 Type = NUMBER  
Catchability = 0.107830E-03 % Variance Contribution = 1.9665  
Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual
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1982	N/A	0.233161E+00	N/A
1983	N/A	0.432884E+00	N/A
1984	N/A	0.473548E+00	N/A
1985	0.331000E+00	0.258897E+00	0.245689E+00
1986	0.528000E+00	0.538339E+00	-0.193923E-01
1987	0.298000E+00	0.295127E+00	0.968938E-02
1988	0.223000E+00	0.303209E+00	-0.307249E+00
1989	0.481000E+00	0.232790E+00	0.725728E+00
1990	0.950000E-01	0.166650E+00	-0.562017E+00
1991	0.110000E+00	0.120807E+00	-0.937124E-01
1992	0.340000E+00	0.145686E+00	0.847492E+00
1993	0.366000E+00	0.114499E+00	0.116207E+01
1994	0.152000E+00	0.187407E+00	-0.209401E+00
1995	0.850000E-01	0.238464E+00	-0.103157E+01
1996	0.117000E+00	0.332402E+00	-0.104417E+01
1997	0.118800E+01	0.597781E+00	0.686801E+00
1998	0.137300E+01	0.896478E+00	0.426280E+00
1999	0.105400E+01	0.825441E+00	0.244430E+00
2000	0.148400E+01	0.918964E+00	0.479249E+00
2001	0.871000E+00	0.882923E+00	-0.135964E-01
2002	0.113700E+01	0.109992E+01	0.331563E-01
2003	0.193000E+01	0.117258E+01	0.498315E+00
2004	0.131900E+01	0.122869E+01	0.709243E-01
2005	0.755000E+00	0.138932E+01	-0.609852E+00
2006	0.744000E+00	0.109775E+01	-0.388976E+00
2007	0.592000E+00	0.186944E+01	-0.114989E+01

Survey Index: 26 Tag: CT\_F AGE = 4  
Time = JAN-1 Type = NUMBER  
Catchability = 0.882136E-04 % Variance Contribution = 2.2883  
Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual
1982	N/A	0.688084E-01	N/A
1983	N/A	0.824425E-01	N/A
1984	N/A	0.118667E+00	N/A
1985	0.720000E-01	0.698143E-01	0.308278E-01
1986	0.750000E-01	0.360701E-01	0.732023E+00
1987	0.720000E-01	0.670987E-01	0.705011E-01
1988	0.330000E-01	0.685910E-01	-0.731653E+00
1989	0.370000E-01	0.372910E-01	-0.783372E-02
1990	0.150000E-01	0.249081E-01	-0.507143E+00
1991	0.420000E-01	0.338481E-01	0.215788E+00
1992	0.360000E-01	0.229765E-01	0.449047E+00
1993	0.460000E-01	0.108906E-01	0.144074E+01
1994	0.390000E-01	0.322234E-01	0.190870E+00
1995	0.240000E-01	0.484774E-01	-0.703043E+00
1996	0.120000E-01	0.624916E-01	-0.165013E+01
1997	0.420000E-01	0.826786E-01	-0.677291E+00
1998	0.373000E+00	0.153356E+00	0.888819E+00
1999	0.321000E+00	0.190362E+00	0.522512E+00
2000	0.346000E+00	0.237103E+00	0.377944E+00
2001	0.341000E+00	0.248848E+00	0.315039E+00
2002	0.436000E+00	0.296942E+00	0.384104E+00
2003	0.479000E+00	0.433467E+00	0.998852E-01
2004	0.407000E+00	0.469179E+00	-0.142171E+00
2005	0.440000E+00	0.453055E+00	-0.292389E-01
2006	0.355000E+00	0.610461E+00	-0.542097E+00
2007	0.230000E+00	0.476079E+00	-0.727503E+00

Survey Index: 27 Tag: CT\_F AGE = 5 - 7  
Time = JAN-1 Type = NUMBER  
Catchability = 0.606059E-04 % Variance Contribution = 3.6369  
Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual
1982	N/A	0.227563E-01	N/A
1983	N/A	0.268709E-01	N/A
1984	N/A	0.106023E-01	N/A
1985	0.250000E-01	0.254292E-01	-0.170228E-01
1986	0.900000E-02	0.184677E-01	-0.718801E+00
1987	0.700000E-02	0.105603E-01	-0.411188E+00
1988	0.300000E-02	0.117717E-01	-0.136708E+01
1989	0.300000E-02	0.546831E-02	-0.600358E+00
1990	0.100000E-02	0.329206E-02	-0.119151E+01
1991	0.120000E-01	0.263030E-02	0.151781E+01
1992	0.220000E-01	0.757744E-02	0.106587E+01
1993	0.250000E-01	0.736687E-02	0.122188E+01
1994	0.700000E-02	0.422681E-02	0.504462E+00
1995	0.900000E-02	0.758303E-02	0.171311E+00
1996	0.500000E-02	0.802065E-02	-0.472582E+00
1997	0.500000E-02	0.142726E-01	-0.104891E+01
1998	0.400000E-01	0.186997E-01	0.760371E+00

1999	0.750000E-01	0.412629E-01	0.597523E+00
2000	0.127000E+00	0.557755E-01	0.822853E+00
2001	0.191000E+00	0.717403E-01	0.979221E+00
2002	0.134000E+00	0.961391E-01	0.332044E+00
2003	0.183000E+00	0.151081E+00	0.191671E+00
2004	0.203000E+00	0.231153E+00	-0.129874E+00
2005	0.119000E+00	0.328558E+00	-0.101559E+01
2006	0.151000E+00	0.243214E+00	-0.476660E+00
2007	0.179000E+00	0.366068E+00	-0.715434E+00

Survey Index: 29 Tag: RI\_F AGE = 3  
Time = JAN-1 Type = NUMBER  
Catchability = 0.111458E-03 % Variance Contribution = 3.5748  
Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual
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1982	0.174000E+01	0.241007E+00	0.197682E+01
1983	0.520000E+00	0.447450E+00	0.150265E+00
1984	0.420000E+00	0.489482E+00	-0.153093E+00
1985	0.490000E+00	0.267608E+00	0.604882E+00
1986	0.280000E+00	0.556453E+00	-0.686793E+00
1987	0.510000E+00	0.305057E+00	0.513913E+00
1988	0.370000E+00	0.313411E+00	0.165988E+00
1989	0.240000E+00	0.240623E+00	-0.259405E-02
1990	0.700000E-01	0.172257E+00	-0.900493E+00
1991	0.120000E+00	0.124872E+00	-0.397952E-01
1992	0.800000E-01	0.150588E+00	-0.632521E+00
1993	0.410000E+00	0.118351E+00	0.124250E+01
1994	0.220000E+00	0.193713E+00	0.127251E+00
1995	0.300000E-01	0.246488E+00	-0.210612E+01
1996	0.200000E+00	0.343587E+00	-0.541123E+00
1997	0.103000E+01	0.617895E+00	0.510995E+00
1998	0.960000E+00	0.926642E+00	0.353657E-01
1999	0.360000E+00	0.853215E+00	-0.862908E+00
2000	0.191000E+01	0.949886E+00	0.698517E+00
2001	0.124000E+01	0.912632E+00	0.306534E+00
2002	0.630000E+00	0.113693E+01	-0.590366E+00
2003	0.138000E+01	0.121203E+01	0.129784E+00
2004	0.208000E+01	0.127003E+01	0.493324E+00
2005	0.130000E+01	0.143607E+01	-0.995446E-01
2006	0.138000E+01	0.113469E+01	0.195728E+00
2007	0.113000E+01	0.193234E+01	-0.536514E+00

Survey Index: 30 Tag: RI\_F AGE = 4  
Time = JAN-1 Type = NUMBER  
Catchability = 0.854502E-04 % Variance Contribution = 4.4307  
Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual
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1982	0.200000E+00	0.666529E-01	0.109882E+01
1983	0.700000E-01	0.798599E-01	-0.131779E+00

1984	0.110000E+00	0.114950E+00	-0.440133E-01
1985	0.100000E+00	0.676273E-01	0.391159E+00
1986	0.200000E-01	0.349402E-01	-0.557906E+00
1987	0.130000E+00	0.649968E-01	0.693197E+00
1988	0.200000E-01	0.664423E-01	-0.120060E+01
1989	N/A	0.361228E-01	N/A
1990	N/A	0.241278E-01	N/A
1991	N/A	0.327877E-01	N/A
1992	0.100000E-01	0.222567E-01	-0.800060E+00
1993	0.110000E+00	0.105495E-01	0.234441E+01
1994	0.700000E-01	0.312139E-01	0.807631E+00
1995	N/A	0.469588E-01	N/A
1996	N/A	0.605340E-01	N/A
1997	0.100000E-01	0.800886E-01	-0.208055E+01
1998	0.300000E-01	0.148552E+00	-0.159974E+01
1999	0.900000E-01	0.184399E+00	-0.717292E+00
2000	0.350000E+00	0.229676E+00	0.421266E+00
2001	0.450000E+00	0.241053E+00	0.624231E+00
2002	0.300000E+00	0.287640E+00	0.420715E-01
2003	0.400000E+00	0.419888E+00	-0.485237E-01
2004	0.490000E+00	0.454481E+00	0.752483E-01
2005	0.780000E+00	0.438863E+00	0.575107E+00
2006	0.690000E+00	0.591338E+00	0.154304E+00
2007	0.440000E+00	0.461165E+00	-0.469809E-01

Survey Index: 31 Tag: RI\_X AGE = 1  
Time = JAN-1 Type = NUMBER  
Catchability = 0.104477E-04 % Variance Contribution = 2.7813  
Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual
1982	N/A	0.440535E+00	N/A
1983	N/A	0.572068E+00	N/A
1984	N/A	0.628328E+00	N/A
1985	N/A	0.361437E+00	N/A
1986	N/A	0.388167E+00	N/A
1987	N/A	0.429008E+00	N/A
1988	N/A	0.357245E+00	N/A
1989	N/A	0.102281E+00	N/A
1990	0.170000E+00	0.219501E+00	-0.255557E+00
1991	0.700000E-01	0.237099E+00	-0.121998E+01
1992	0.150000E+00	0.231648E+00	-0.434583E+00
1993	0.110000E+00	0.258939E+00	-0.856111E+00
1994	0.800000E-01	0.267296E+00	-0.120633E+01
1995	0.200000E+00	0.281979E+00	-0.343516E+00
1996	0.410000E+00	0.321154E+00	0.244237E+00
1997	0.170000E+00	0.237588E+00	-0.334739E+00
1998	0.700000E-01	0.245926E+00	-0.125654E+01
1999	0.260000E+00	0.263784E+00	-0.144493E-01
2000	0.630000E+00	0.243322E+00	0.951333E+00
2001	0.420000E+00	0.278427E+00	0.411099E+00
2002	0.810000E+00	0.259803E+00	0.113711E+01
2003	0.148000E+01	0.298407E+00	0.160134E+01
2004	0.540000E+00	0.222886E+00	0.884909E+00

2005 0.550000E+00 0.363614E+00 0.413827E+00  
 2006 0.190000E+00 0.143893E+00 0.277954E+00  
 2007 N/A 0.265549E+00 N/A  
 Survey Index: 32 Tag: RI\_X AGE = 2 - 7  
 Time = JAN-1 Type = NUMBER  
 Catchability = 0.209505E-04 % Variance Contribution = 1.8304  
 Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual
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1982	N/A	0.402411E+00	N/A
1983	N/A	0.472852E+00	N/A
1984	N/A	0.532117E+00	N/A
1985	N/A	0.609611E+00	N/A
1986	N/A	0.439016E+00	N/A
1987	N/A	0.393549E+00	N/A
1988	N/A	0.461141E+00	N/A
1989	N/A	0.260073E+00	N/A
1990	0.100000E+00	0.117832E+00	-0.164088E+00
1991	0.800000E-01	0.227775E+00	-0.104633E+01
1992	0.180000E+00	0.198988E+00	-0.100290E+00
1993	0.140000E+00	0.198548E+00	-0.349388E+00
1994	0.500000E-01	0.260398E+00	-0.165019E+01
1995	0.220000E+00	0.305089E+00	-0.326975E+00
1996	0.530000E+00	0.435345E+00	0.196739E+00
1997	0.520000E+00	0.537539E+00	-0.331722E-01
1998	0.360000E+00	0.559072E+00	-0.440175E+00
1999	0.610000E+00	0.581426E+00	0.479754E-01
2000	0.189000E+01	0.645933E+00	0.107364E+01
2001	0.550000E+00	0.625857E+00	-0.129204E+00
2002	0.111000E+01	0.720038E+00	0.432811E+00
2003	0.225000E+01	0.788074E+00	0.104909E+01
2004	0.153000E+01	0.890053E+00	0.541742E+00
2005	0.189000E+01	0.837131E+00	0.814351E+00
2006	0.109000E+01	0.100272E+01	0.834653E-01
2007	N/A	0.818811E+00	N/A

Survey Index: 33 Tag: NJ AGE = 1  
 Time = JAN-1 Type = NUMBER  
 Catchability = 0.158198E-03 % Variance Contribution = 1.8036  
 Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual
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1982	N/A	0.667054E+01	N/A
1983	N/A	0.866220E+01	N/A
1984	N/A	0.951409E+01	N/A
1985	N/A	0.547285E+01	N/A
1986	N/A	0.587759E+01	N/A
1987	N/A	0.649600E+01	N/A
1988	0.306000E+01	0.540937E+01	-0.569718E+00
1989	0.510000E+00	0.154873E+01	-0.111078E+01
1990	0.144000E+01	0.332366E+01	-0.836424E+00

1991	0.269000E+01	0.359014E+01	-0.288649E+00
1992	0.300000E+01	0.350759E+01	-0.156317E+00
1993	0.569000E+01	0.392083E+01	0.372408E+00
1994	0.107000E+01	0.404738E+01	-0.133041E+01
1995	0.293000E+01	0.426970E+01	-0.376542E+00
1996	0.510000E+01	0.486288E+01	0.476089E-01
1997	0.825000E+01	0.359753E+01	0.829964E+00
1998	0.580000E+01	0.372379E+01	0.443116E+00
1999	0.612000E+01	0.399420E+01	0.426720E+00
2000	0.391000E+01	0.368437E+01	0.594390E-01
2001	0.332000E+01	0.421592E+01	-0.238902E+00
2002	0.911000E+01	0.393391E+01	0.839738E+00
2003	0.561000E+01	0.451846E+01	0.216380E+00
2004	0.627000E+01	0.337492E+01	0.619405E+00
2005	0.599000E+01	0.550580E+01	0.842885E-01
2006	0.574000E+01	0.217881E+01	0.968678E+00
2007	N/A	0.402091E+01	N/A

Survey Index: 34 Tag: NJ AGE = 2  
Time = JAN-1 Type = NUMBER  
Catchability = 0.688016E-04 % Variance Contribution = 4.0492  
Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual
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1982	N/A	0.109325E+01	N/A
1983	N/A	0.118184E+01	N/A
1984	N/A	0.134073E+01	N/A
1985	N/A	0.175346E+01	N/A
1986	N/A	0.104914E+01	N/A
1987	N/A	0.103979E+01	N/A
1988	0.103000E+01	0.125407E+01	-0.196832E+00
1989	0.180000E+00	0.670256E+00	-0.131470E+01
1990	0.110000E+00	0.257464E+00	-0.850400E+00
1991	0.270000E+00	0.641546E+00	-0.865460E+00
1992	0.570000E+00	0.534000E+00	0.652400E-01
1993	0.200000E+00	0.562118E+00	-0.103340E+01
1994	0.800000E-01	0.705642E+00	-0.217708E+01
1995	0.280000E+00	0.803341E+00	-0.105399E+01
1996	0.270000E+01	0.115974E+01	0.845058E+00
1997	0.525000E+01	0.130317E+01	0.139342E+01
1998	0.267000E+01	0.112316E+01	0.865935E+00
1999	0.346000E+01	0.118741E+01	0.106949E+01
2000	0.182000E+01	0.128665E+01	0.346793E+00
2001	0.118000E+01	0.121643E+01	-0.304099E-01
2002	0.413000E+01	0.132206E+01	0.113909E+01
2003	0.255000E+01	0.133028E+01	0.650705E+00
2004	0.249000E+01	0.151062E+01	0.499763E+00
2005	0.124000E+01	0.113633E+01	0.873045E-01
2006	0.322000E+01	0.184027E+01	0.559469E+00
2007	N/A	0.709291E+00	N/A

Survey Index: 35 Tag: NJ AGE = 3  
Time = JAN-1 Type = NUMBER  
Catchability = 0.436851E-04 % Variance Contribution = 1.9201

Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual
1982	N/A	0.944603E-01	N/A
1983	N/A	0.175374E+00	N/A
1984	N/A	0.191848E+00	N/A
1985	N/A	0.104887E+00	N/A
1986	N/A	0.218097E+00	N/A
1987	N/A	0.119564E+00	N/A
1988	N/A	0.122838E+00	N/A
1989	N/A	0.943101E-01	N/A
1990	0.300000E-01	0.675146E-01	-0.811146E+00
1991	0.200000E-01	0.489423E-01	-0.894910E+00
1992	0.600000E-01	0.590216E-01	0.164418E-01
1993	0.100000E-01	0.463867E-01	-0.153443E+01
1994	N/A	0.759239E-01	N/A
1995	0.500000E-01	0.966088E-01	-0.658647E+00
1996	0.180000E+00	0.134666E+00	0.290161E+00
1997	0.102000E+01	0.242178E+00	0.143788E+01
1998	0.290000E+00	0.363189E+00	-0.225042E+00
1999	0.650000E+00	0.334410E+00	0.664605E+00
2000	0.450000E+00	0.372299E+00	0.189551E+00
2001	0.410000E+00	0.357698E+00	0.136469E+00
2002	0.128000E+01	0.445609E+00	0.105517E+01
2003	0.570000E+00	0.475045E+00	0.182227E+00
2004	0.570000E+00	0.497778E+00	0.135482E+00
2005	0.530000E+00	0.562853E+00	-0.601423E-01
2006	0.480000E+00	0.444730E+00	0.763197E-01
2007	N/A	0.757363E+00	N/A

Survey Index: 36 Tag: NJ AGE = 4 - 7  
 Time = JAN-1 Type = NUMBER  
 Catchability = 0.588380E-04 % Variance Contribution = 1.4859  
 Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual
1982	N/A	0.679873E-01	N/A
1983	N/A	0.810758E-01	N/A
1984	N/A	0.894432E-01	N/A
1985	N/A	0.712532E-01	N/A
1986	N/A	0.419876E-01	N/A
1987	N/A	0.550067E-01	N/A
1988	N/A	0.571781E-01	N/A
1989	N/A	0.301817E-01	N/A
1990	N/A	0.198096E-01	N/A
1991	N/A	0.251301E-01	N/A
1992	0.200000E-01	0.226816E-01	-0.125823E+00
1993	0.100000E-01	0.144160E-01	-0.365751E+00
1994	0.200000E-01	0.255963E-01	-0.246717E+00
1995	0.160000E+00	0.396960E-01	0.139392E+01
1996	0.500000E-01	0.494683E-01	0.106918E-01
1997	0.180000E+00	0.690025E-01	0.958814E+00



1998	0.400000E-01	0.120442E+00	-0.110229E+01
1999	0.180000E+00	0.167030E+00	0.747840E-01
2000	0.220000E+00	0.212295E+00	0.356508E-01
2001	0.150000E+00	0.235628E+00	-0.451620E+00
2002	0.810000E+00	0.291394E+00	0.102236E+01
2003	0.510000E+00	0.435794E+00	0.157241E+00
2004	0.430000E+00	0.537350E+00	-0.222865E+00
2005	0.320000E+00	0.621159E+00	-0.663266E+00
2006	0.400000E+00	0.643293E+00	-0.475137E+00
2007	N/A	0.672932E+00	N/A

Survey Index: 40 Tag: CT\_Y AGE = 0  
Time = JAN-1 Type = NUMBER  
Catchability = 0.184557E-05 % Variance Contribution = 3.7718  
Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual
1982	N/A	0.134296E+00	N/A
1983	N/A	0.145585E+00	N/A
1984	N/A	0.877426E-01	N/A
1985	0.240000E+00	0.879787E-01	0.100354E+01
1986	0.172000E+00	0.965143E-01	0.577803E+00
1987	0.750000E-01	0.793931E-01	-0.569234E-01
1988	0.150000E-01	0.236851E-01	-0.456796E+00
1989	N/A	0.493129E-01	N/A
1990	0.320000E-01	0.549313E-01	-0.540348E+00
1991	0.360000E-01	0.520172E-01	-0.368055E+00
1992	0.130000E-01	0.586519E-01	-0.150667E+01
1993	0.840000E-01	0.602864E-01	0.331710E+00
1994	0.132000E+00	0.641722E-01	0.721232E+00
1995	0.230000E-01	0.704972E-01	-0.112008E+01
1996	0.690000E-01	0.515917E-01	0.290746E+00
1997	0.330000E-01	0.531220E-01	-0.476084E+00
1998	N/A	0.570056E-01	N/A
1999	0.440000E-01	0.528677E-01	-0.183602E+00
2000	0.120000E-01	0.601181E-01	-0.161140E+01
2001	0.210000E-01	0.560774E-01	-0.982210E+00
2002	0.442000E+00	0.649381E-01	0.191788E+01
2003	N/A	0.486171E-01	N/A
2004	0.255000E+00	0.786710E-01	0.117599E+01
2005	0.670000E-01	0.315450E-01	0.753276E+00
2006	0.980000E-01	0.576836E-01	0.529995E+00
2007	N/A	0.000000E+00	N/A

Survey Index: 41 Tag: VA\_CRY AGE = 0  
Time = JAN-1 Type = NUMBER  
Catchability = 0.281985E-04 % Variance Contribution = 1.8494  
Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual
1982	0.227000E+01	0.205191E+01	0.101010E+00

1983	0.501000E+01	0.222439E+01	0.811954E+00
1984	0.158000E+01	0.134062E+01	0.164292E+00
1985	0.126000E+01	0.134423E+01	-0.647082E-01
1986	0.126000E+01	0.147464E+01	-0.157305E+00
1987	0.390000E+00	0.121305E+01	-0.113475E+01
1988	0.540000E+00	0.361885E+00	0.400242E+00
1989	0.124000E+01	0.753453E+00	0.498200E+00
1990	0.254000E+01	0.839296E+00	0.110736E+01
1991	0.264000E+01	0.794772E+00	0.120048E+01
1992	0.890000E+00	0.896143E+00	-0.687871E-02
1993	0.500000E+00	0.921117E+00	-0.610979E+00
1994	0.241000E+01	0.980488E+00	0.899332E+00
1995	0.630000E+00	0.107713E+01	-0.536333E+00
1996	0.810000E+00	0.788270E+00	0.271930E-01
1997	0.890000E+00	0.811652E+00	0.921498E-01
1998	0.730000E+00	0.870989E+00	-0.176585E+00
1999	0.530000E+00	0.807766E+00	-0.421395E+00
2000	0.570000E+00	0.918545E+00	-0.477155E+00
2001	0.470000E+00	0.856807E+00	-0.600480E+00
2002	0.770000E+00	0.992190E+00	-0.253524E+00
2003	0.440000E+00	0.742821E+00	-0.523681E+00
2004	0.130000E+01	0.120202E+01	0.783647E-01
2005	0.350000E+00	0.481977E+00	-0.319964E+00
2006	0.800000E+00	0.881348E+00	-0.968410E-01
2007	N/A	0.000000E+00	N/A

Survey Index: 43 Tag: MD\_Y AGE = 0  
Time = JAN-1 Type = NUMBER  
Catchability = 0.238811E-03 % Variance Contribution = 2.3052  
Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual
1982	0.340800E+01	0.173774E+02	-0.162905E+01
1983	0.176990E+02	0.188382E+02	-0.623780E-01
1984	0.133100E+02	0.113536E+02	0.158979E+00
1985	0.128430E+02	0.113842E+02	0.120575E+00
1986	0.595260E+02	0.124886E+02	0.156159E+01
1987	0.758400E+01	0.102732E+02	-0.303500E+00
1988	0.176300E+01	0.306478E+01	-0.552959E+00
1989	0.285500E+01	0.638094E+01	-0.804243E+00
1990	0.473300E+01	0.710794E+01	-0.406653E+00
1991	0.733700E+01	0.673086E+01	0.862266E-01
1992	0.848700E+01	0.758937E+01	0.111787E+00
1993	0.414500E+01	0.780087E+01	-0.632333E+00
1994	0.223110E+02	0.830368E+01	0.988381E+00
1995	0.130670E+02	0.912211E+01	0.359388E+00
1996	0.649300E+01	0.667581E+01	-0.277653E-01
1997	0.799700E+01	0.687382E+01	0.151346E+00
1998	0.149830E+02	0.737634E+01	0.708638E+00
1999	0.856500E+01	0.684091E+01	0.224763E+00
2000	0.987400E+01	0.777909E+01	0.238465E+00
2001	0.135430E+02	0.725624E+01	0.624009E+00
2002	0.540600E+01	0.840278E+01	-0.441054E+00
2003	0.818000E+01	0.629090E+01	0.262588E+00

2004	0.699300E+01	0.101798E+02	-0.375494E+00
2005	0.219800E+01	0.408183E+01	-0.618998E+00
2006	0.965800E+01	0.746407E+01	0.257685E+00
2007	N/A	0.000000E+00	N/A

Survey Index: 44 Tag: NJ\_Y AGE = 0  
Time = JAN-1 Type = NUMBER  
Catchability = 0.392777E-04 % Variance Contribution = 1.7872  
Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual
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1982	N/A	0.285810E+01	N/A
1983	N/A	0.309835E+01	N/A
1984	N/A	0.186735E+01	N/A
1985	N/A	0.187237E+01	N/A
1986	N/A	0.205403E+01	N/A
1987	N/A	0.168965E+01	N/A
1988	0.170000E+00	0.504069E+00	-0.108691E+01
1989	0.100000E+01	0.104948E+01	-0.482972E-01
1990	0.128000E+01	0.116905E+01	0.906653E-01
1991	0.100000E+01	0.110704E+01	-0.101686E+00
1992	0.110000E+01	0.124824E+01	-0.126421E+00
1993	0.255000E+01	0.128302E+01	0.686875E+00
1994	0.166000E+01	0.136572E+01	0.195136E+00
1995	0.495000E+01	0.150033E+01	0.119370E+01
1996	0.166000E+01	0.109798E+01	0.413345E+00
1997	0.165000E+01	0.113055E+01	0.378073E+00
1998	0.670000E+00	0.121320E+01	-0.593738E+00
1999	0.103000E+01	0.112513E+01	-0.883442E-01
2000	0.950000E+00	0.127944E+01	-0.297716E+00
2001	0.620000E+00	0.119344E+01	-0.654879E+00
2002	0.151000E+01	0.138202E+01	0.885644E-01
2003	0.600000E+00	0.103467E+01	-0.544912E+00
2004	0.900000E+00	0.167428E+01	-0.620746E+00
2005	0.311000E+01	0.671345E+00	0.153309E+01
2006	0.810000E+00	0.122763E+01	-0.415805E+00
2007	N/A	0.000000E+00	N/A

Survey Index: 45 Tag: NEC\_Y AGE = 0  
Time = JAN-1 Type = NUMBER  
Catchability = 0.818325E-05 % Variance Contribution = 3.2225  
Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual
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1982	0.550000E+00	0.595466E+00	-0.794252E-01
1983	0.960000E+00	0.645520E+00	0.396877E+00
1984	0.180000E+00	0.389049E+00	-0.770750E+00
1985	0.590000E+00	0.390096E+00	0.413729E+00
1986	0.390000E+00	0.427943E+00	-0.928436E-01
1987	0.700000E-01	0.352028E+00	-0.161522E+01
1988	0.600000E-01	0.105019E+00	-0.559801E+00

1989	0.310000E+00	0.218653E+00	0.349087E+00
1990	0.440000E+00	0.243565E+00	0.591392E+00
1991	0.760000E+00	0.230644E+00	0.119244E+01
1992	0.990000E+00	0.260062E+00	0.133679E+01
1993	0.230000E+00	0.267309E+00	-0.150327E+00
1994	0.750000E+00	0.284539E+00	0.969204E+00
1995	0.930000E+00	0.312584E+00	0.109031E+01
1996	0.110000E+00	0.228757E+00	-0.732180E+00
1997	0.170000E+00	0.235542E+00	-0.326092E+00
1998	0.380000E+00	0.252762E+00	0.407723E+00
1999	0.210000E+00	0.234414E+00	-0.109983E+00
2000	0.220000E+00	0.266563E+00	-0.191983E+00
2001	0.120000E+00	0.248646E+00	-0.728540E+00
2002	0.600000E-01	0.287935E+00	-0.156839E+01
2003	0.180000E+00	0.215568E+00	-0.180317E+00
2004	0.360000E+00	0.348826E+00	0.315304E-01
2005	0.160000E+00	0.139870E+00	0.134458E+00
2006	0.310000E+00	0.255768E+00	0.192301E+00
2007	N/A	0.000000E+00	N/A

Survey Index: 50 Tag: DE\_IY AGE = 0  
Time = JAN-1 Type = NUMBER  
Catchability = 0.548734E-05 % Variance Contribution = 3.7931  
Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual
1982	N/A	0.399294E+00	N/A
1983	N/A	0.432858E+00	N/A
1984	N/A	0.260880E+00	N/A
1985	N/A	0.261582E+00	N/A
1986	0.320000E+00	0.286960E+00	0.108977E+00
1987	0.260000E+00	0.236055E+00	0.966172E-01
1988	0.100000E-01	0.704216E-01	-0.195191E+01
1989	0.140000E+00	0.146619E+00	-0.461964E-01
1990	0.360000E+00	0.163324E+00	0.790368E+00
1991	0.380000E+00	0.154660E+00	0.898944E+00
1992	0.370000E+00	0.174386E+00	0.752230E+00
1993	0.500000E-01	0.179246E+00	-0.127674E+01
1994	0.570000E+00	0.190799E+00	0.109441E+01
1995	0.300000E+00	0.209605E+00	0.358557E+00
1996	0.800000E-01	0.153395E+00	-0.650987E+00
1997	0.220000E+00	0.157945E+00	0.331383E+00
1998	0.390000E+00	0.169491E+00	0.833345E+00
1999	0.350000E+00	0.157188E+00	0.800488E+00
2000	0.210000E+00	0.178746E+00	0.161144E+00
2001	0.140000E+00	0.166732E+00	-0.174743E+00
2002	0.130000E+00	0.193077E+00	-0.395552E+00
2003	0.210000E+00	0.144550E+00	0.373479E+00
2004	0.270000E+00	0.233908E+00	0.143495E+00
2005	0.100000E-01	0.937911E-01	-0.223848E+01
2006	0.170000E+00	0.171507E+00	-0.882677E-02
2007	N/A	0.000000E+00	N/A

Survey Index: 51 Tag: RI\_XY AGE = 0

Time = JAN-1                      Type = NUMBER  
 Catchability = 0.105736E-05    % Variance Contribution = 2.0427  
 Residual = LN(Observed) - LN(Predicted)

Year	Observed	Predicted	Residual
1982	N/A	0.769404E-01	N/A
1983	N/A	0.834080E-01	N/A
1984	N/A	0.502693E-01	N/A
1985	N/A	0.504046E-01	N/A
1986	N/A	0.552948E-01	N/A
1987	N/A	0.454857E-01	N/A
1988	N/A	0.135696E-01	N/A
1989	N/A	0.282522E-01	N/A
1990	0.200000E-01	0.314711E-01	-0.453338E+00
1991	N/A	0.298016E-01	N/A
1992	0.100000E-01	0.336027E-01	-0.121202E+01
1993	0.100000E-01	0.345392E-01	-0.123951E+01
1994	0.400000E-01	0.367654E-01	0.843227E-01
1995	0.300000E-01	0.403891E-01	-0.297362E+00
1996	0.200000E-01	0.295578E-01	-0.390616E+00
1997	0.400000E-01	0.304345E-01	0.273301E+00
1998	N/A	0.326595E-01	N/A
1999	0.300000E-01	0.302888E-01	-0.958128E-02
2000	0.900000E-01	0.344427E-01	0.960512E+00
2001	0.100000E-01	0.321277E-01	-0.116713E+01
2002	0.110000E+00	0.372042E-01	0.108406E+01
2003	0.500000E-01	0.278536E-01	0.585061E+00
2004	0.100000E+00	0.450720E-01	0.796909E+00
2005	0.400000E-01	0.180727E-01	0.794476E+00
2006	0.400000E-01	0.330479E-01	0.190920E+00
2007	N/A	0.000000E+00	N/A

Bootstrap Summary Report

Number of Bootstrap Repetitions Requested = 1000  
 Number of Bootstrap Repetitions Completed = 1000  
 Bootstrap Output Variable: Stock Estimates (2007)

	NLLS Estimate	Bootstrap Mean	Bootstrap Std Error	C.V. For NLLS Soln.
N 1	25417.	26349.	7012.	0.2661
N 2	10309.	10557.	1972.	0.1868
N 3	17337.	17551.	3000.	0.1709
N 4	5397.	5530.	1089.	0.1969
N 5	4052.	4183.	999.	0.2387
N 6	1050.	1070.	618.	0.5770

	Bias Estimate	Bias Std. Error	Per Cent Bias	NLLS Estimate Corrected For Bias	C.V. For Corrected Estimate
N 1	932.	224.	3.6667	24485.	0.2864
N 2	248.	63.	2.4016	10062.	0.1960
N 3	214.	95.	1.2362	17123.	0.1752
N 4	133.	35.	2.4735	5263.	0.2069
N 5	131.	32.	3.2207	3922.	0.2546
N 6	20.	20.	1.8983	1030.	0.5993

	LOWER 80. % CI	UPPER 80. % CI
N 1	18111.	35811.
N 2	8156.	12982.
N 3	13838.	21682.
N 4	4150.	7029.
N 5	2961.	5484.
N 6	314.	1912.

Bootstrap Output Variable: Catchability Estimates

	NLLS Estimate	Bootstrap Mean	Bootstrap Std Error	C.V. For NLLS Soln.
Q 1	0.141956E-03	0.144377E-03	0.268216E-04	0.1858
Q 2	0.416467E-03	0.417257E-03	0.460376E-04	0.1103
Q 3	0.341157E-03	0.344519E-03	0.446112E-04	0.1295
Q 4	0.337567E-03	0.344664E-03	0.692883E-04	0.2010
Q 5	0.447993E-03	0.454280E-03	0.762677E-04	0.1679
Q 6	0.138176E-04	0.140125E-04	0.201795E-05	0.1440
Q 7	0.379163E-04	0.379396E-04	0.372445E-05	0.0982
Q 8	0.344239E-04	0.347738E-04	0.566360E-05	0.1629
Q 9	0.383975E-04	0.387446E-04	0.490521E-05	0.1266
Q 10	0.652723E-04	0.653020E-04	0.828351E-05	0.1268
Q 11	0.676126E-04	0.677628E-04	0.435628E-05	0.0643
Q 12	0.811036E-04	0.814997E-04	0.101574E-04	0.1246
Q 13	0.756270E-04	0.759580E-04	0.104538E-04	0.1376
Q 15	0.406577E-04	0.408039E-04	0.750765E-05	0.1840
Q 16	0.432367E-04	0.438196E-04	0.691473E-05	0.1578
Q 18	0.168215E-03	0.169128E-03	0.178186E-04	0.1054
Q 19	0.657295E-04	0.663685E-04	0.123035E-04	0.1854
Q 21	0.173459E-04	0.175807E-04	0.277520E-05	0.1579
Q 22	0.184656E-04	0.184226E-04	0.282619E-05	0.1534
Q 23	0.295921E-04	0.299883E-04	0.548508E-05	0.1829
Q 24	0.425758E-04	0.430757E-04	0.671349E-05	0.1559
Q 25	0.107830E-03	0.108402E-03	0.137740E-04	0.1271
Q 26	0.882136E-04	0.889029E-04	0.121949E-04	0.1372
Q 27	0.606059E-04	0.610114E-04	0.103205E-04	0.1692
Q 29	0.111458E-03	0.112712E-03	0.167646E-04	0.1487
Q 30	0.854502E-04	0.879589E-04	0.177854E-04	0.2022
Q 31	0.104477E-04	0.107553E-04	0.217898E-05	0.2026
Q 32	0.209505E-04	0.213432E-04	0.354405E-05	0.1661
Q 33	0.158198E-03	0.160302E-03	0.235884E-04	0.1471
Q 34	0.688016E-04	0.702375E-04	0.151014E-04	0.2150
Q 35	0.436851E-04	0.441118E-04	0.834166E-05	0.1891
Q 36	0.588380E-04	0.595460E-04	0.102164E-04	0.1716
Q 40	0.184557E-05	0.187828E-05	0.417155E-06	0.2221
Q 41	0.281985E-04	0.283534E-04	0.304266E-05	0.1073
Q 43	0.238811E-03	0.238872E-03	0.293040E-04	0.1227
Q 44	0.392777E-04	0.397527E-04	0.601836E-05	0.1514
Q 45	0.818325E-05	0.825855E-05	0.120797E-05	0.1463
Q 50	0.548734E-05	0.560958E-05	0.107908E-05	0.1924
Q 51	0.105736E-05	0.107593E-05	0.216337E-06	0.2011

	Bias Estimate	Bias Std. Error	Per Cent Bias	NLLS Estimate Corrected For Bias	C.V. For Corrected Estimate
Q 1	0.2421E-05	0.8516E-06	1.7053	0.1395E-03	0.1922
Q 2	0.7895E-06	0.1456E-05	0.1896	0.4157E-03	0.1108
Q 3	0.3363E-05	0.1415E-05	0.9856	0.3378E-03	0.1321
Q 4	0.7097E-05	0.2203E-05	2.1022	0.3305E-03	0.2097
Q 5	0.6287E-05	0.2420E-05	1.4034	0.4417E-03	0.1727
Q 6	0.1949E-06	0.6411E-07	1.4107	0.1362E-04	0.1481
Q 7	0.2328E-07	0.1178E-06	0.0614	0.3789E-04	0.0983
Q 8	0.3499E-06	0.1794E-06	1.0165	0.3407E-04	0.1662
Q 9	0.3471E-06	0.1555E-06	0.9040	0.3805E-04	0.1289
Q 10	0.2969E-07	0.2619E-06	0.0455	0.6524E-04	0.1270
Q 11	0.1502E-06	0.1378E-06	0.2222	0.6746E-04	0.0646
Q 12	0.3961E-06	0.3214E-06	0.4884	0.8071E-04	0.1259
Q 13	0.3309E-06	0.3307E-06	0.4376	0.7530E-04	0.1388
Q 15	0.1462E-06	0.2375E-06	0.3596	0.4051E-04	0.1853
Q 16	0.5829E-06	0.2194E-06	1.3482	0.4265E-04	0.1621
Q 18	0.9127E-06	0.5642E-06	0.5426	0.1673E-03	0.1065
Q 19	0.6390E-06	0.3896E-06	0.9722	0.6509E-04	0.1890
Q 21	0.2348E-06	0.8807E-07	1.3539	0.1711E-04	0.1622
Q 22	-0.4295E-07	0.8938E-07	-0.2326	0.1851E-04	0.1527
Q 23	0.3962E-06	0.1739E-06	1.3388	0.2920E-04	0.1879
Q 24	0.5000E-06	0.2129E-06	1.1743	0.4208E-04	0.1596
Q 25	0.5713E-06	0.4359E-06	0.5298	0.1073E-03	0.1284
Q 26	0.6893E-06	0.3863E-06	0.7814	0.8752E-04	0.1393
Q 27	0.4055E-06	0.3266E-06	0.6690	0.6020E-04	0.1714
Q 29	0.1254E-05	0.5316E-06	1.1250	0.1102E-03	0.1521
Q 30	0.2509E-05	0.5680E-06	2.9358	0.8294E-04	0.2144
Q 31	0.3076E-06	0.6959E-07	2.9443	0.1014E-04	0.2149
Q 32	0.3926E-06	0.1128E-06	1.8741	0.2056E-04	0.1724
Q 33	0.2104E-05	0.7489E-06	1.3303	0.1561E-03	0.1511
Q 34	0.1436E-05	0.4797E-06	2.0870	0.6737E-04	0.2242
Q 35	0.4267E-06	0.2641E-06	0.9767	0.4326E-04	0.1928
Q 36	0.7080E-06	0.3238E-06	1.2032	0.5813E-04	0.1758
Q 40	0.3271E-07	0.1323E-07	1.7724	0.1813E-05	0.2301
Q 41	0.1548E-06	0.9634E-07	0.5490	0.2804E-04	0.1085
Q 43	0.6051E-07	0.9267E-06	0.0253	0.2388E-03	0.1227
Q 44	0.4751E-06	0.1909E-06	1.2095	0.3880E-04	0.1551
Q 45	0.7530E-07	0.3827E-07	0.9202	0.8108E-05	0.1490
Q 50	0.1222E-06	0.3434E-07	2.2277	0.5365E-05	0.2011
Q 51	0.1857E-07	0.6866E-08	1.7565	0.1039E-05	0.2083



	LOWER	UPPER
	80. % CI	80. % CI
Q 1	0.112036E-03	0.180010E-03
Q 2	0.359080E-03	0.478381E-03
Q 3	0.286682E-03	0.401303E-03
Q 4	0.261438E-03	0.438939E-03
Q 5	0.358378E-03	0.556110E-03
Q 6	0.115449E-04	0.167038E-04
Q 7	0.332723E-04	0.428684E-04
Q 8	0.280821E-04	0.420938E-04
Q 9	0.330031E-04	0.449621E-04
Q 10	0.549324E-04	0.763026E-04
Q 11	0.624910E-04	0.733437E-04
Q 12	0.688536E-04	0.947504E-04
Q 13	0.628368E-04	0.900336E-04
Q 15	0.317869E-04	0.504297E-04
Q 16	0.352138E-04	0.530894E-04
Q 18	0.146402E-03	0.191180E-03
Q 19	0.507996E-04	0.820121E-04
Q 21	0.141584E-04	0.211271E-04
Q 22	0.147976E-04	0.220057E-04
Q 23	0.233439E-04	0.373245E-04
Q 24	0.348111E-04	0.521047E-04
Q 25	0.913635E-04	0.126317E-03
Q 26	0.743632E-04	0.105116E-03
Q 27	0.482438E-04	0.746251E-04
Q 29	0.920065E-04	0.134781E-03
Q 30	0.661910E-04	0.111862E-03
Q 31	0.807179E-05	0.138281E-04
Q 32	0.169426E-04	0.258124E-04
Q 33	0.131372E-03	0.191889E-03
Q 34	0.519500E-04	0.895232E-04
Q 35	0.337537E-04	0.551920E-04
Q 36	0.471333E-04	0.735044E-04
Q 40	0.138653E-05	0.241088E-05
Q 41	0.245639E-04	0.322148E-04
Q 43	0.201019E-03	0.275279E-03
Q 44	0.323671E-04	0.475623E-04
Q 45	0.674154E-05	0.988610E-05
Q 50	0.428971E-05	0.711304E-05
Q 51	0.813957E-06	0.135144E-05

Bootstrap Output Variable: Fishing Mortality (2006)

	NLLS Estimate	Bootstrap Mean	Bootstrap Std Error	C.V. For NLLS Soln.
AGE 0	0.0068	0.0070	0.001881	0.2691
AGE 1	0.0897	0.0905	0.016744	0.1850
AGE 2	0.2336	0.2366	0.037063	0.1567
AGE 3	0.4346	0.4376	0.072465	0.1656
AGE 4	0.3351	0.3402	0.070982	0.2086
AGE 5	0.5542	0.8471	0.966894	1.1414
AGE 6	0.4413	0.5416	0.322605	0.5956
AGE 7	0.4413	0.5416	0.322605	0.5956

	Bias Estimate	Bias Std. Error	Per Cent Bias	NLLS Estimate Corrected For Bias	C.V. For Corrected Estimate
AGE 0	0.000226	0.000060	3.3477	0.0065	0.2877
AGE 1	0.000871	0.000530	0.9712	0.0888	0.1886
AGE 2	0.002987	0.001176	1.2785	0.2306	0.1607
AGE 3	0.002936	0.002293	0.6754	0.4317	0.1679
AGE 4	0.005071	0.002250	1.5131	0.3301	0.2151
AGE 5	0.292848	0.031949	52.8383	0.2614	3.6991
AGE 6	0.100285	0.010684	22.7231	0.3410	0.9459
AGE 7	0.100285	0.010684	22.7231	0.3410	0.9459

	LOWER 80. % CI	UPPER 80. % CI
AGE 0	0.004805	0.009459
AGE 1	0.071776	0.111962
AGE 2	0.190978	0.284672
AGE 3	0.349422	0.533902
AGE 4	0.257760	0.433694
AGE 5	0.342392	1.237426
AGE 6	0.366798	0.661731
AGE 7	0.366798	0.661731

Bootstrap Output Variable: Average F (2006) AGES 3 - 5

	NLLS Estimate	Bootstrap Mean	Bootstrap Std Error	C.V. For NLLS Soln.
AVG F	0.4413	0.5416	0.322605	0.5956
N WTD	0.4128	0.4215	0.065338	0.1550
B WTD	0.4149	0.4287	0.080532	0.1879
C WTD	0.4221	0.4680	0.147340	0.3148

	Bias Estimate	Bias Std. Error	Per Cent Bias	NLLS Estimate Corrected For Bias	C.V. For Corrected Estimate
AVG F	0.100285	0.010684	22.7231	0.3410	0.9459
N WTD	0.008625	0.002084	2.0892	0.4042	0.1616
B WTD	0.013761	0.002584	3.3164	0.4012	0.2007
C WTD	0.045987	0.004881	10.8961	0.3761	0.3918

	LOWER 80. % CI	UPPER 80. % CI
AVG F	0.366798	0.661731
N WTD	0.351353	0.500226
B WTD	0.351202	0.509919
C WTD	0.364438	0.541993

Bootstrap Output Variable: Biomass

JAN-1 Biomass (2007) Mean Biomass & SSB (2006)

	NLLS Estimate	Bootstrap Mean	Bootstrap Std Error	C.V. For NLLS Soln.	
JAN-1	45974.	46852.	4806.	0.1026	
MEAN	44433.	45150.	4011.	0.0888	
SSB	40508.	41148.	4108.	0.0998	
	Bias Estimate	Bias Std. Error	Per Cent Bias	NLLS Estimate Corrected For Bias	C.V. For Corrected Estimate
JAN-1	878.	155.	1.9098	45096.	0.1066
MEAN	717.	129.	1.6140	43716.	0.0918
SSB	640.	131.	1.5809	39868.	0.1030
	LOWER 80. % CI	UPPER 80. % CI			
JAN-1	40829.	52971.			
MEAN	40097.	50304.			
SSB	35922.	46331.			

Plus Group Diagnostic Report

Calculation Method Selected = Backward

Year	Population Backward	Population Forward	F Forward	F Backward	Ratio
1982	67.	67.	0.663932	0.663932	1.000000
1983	71.	92.	0.713070	1.057326	1.482781
1984	14.	44.	0.283633	1.391481	4.905918
1985	11.	29.	0.366595	1.434884	3.914087
1986	20.	24.	1.089646	1.670284	1.532869
1987	71.	54.	2.078124	1.125094	0.541399
1988	27.	26.	2.078124	1.794470	0.863505
1989	5.	5.	2.078124	1.878650	0.904013
1990	4.	4.	2.078124	1.278000	0.614978
1991	2.	3.	0.506289	1.189165	2.348787
1992	1.	3.	0.567854	1.779020	3.132882
1993	6.	4.	2.078124	0.887367	0.427004
1994	9.	12.	0.575801	0.956601	1.661340
1995	2.	14.	0.085042	1.036577	12.188986
1996	5.	12.	0.317148	1.005173	3.169409
1997	7.	15.	0.334670	0.984998	2.943196
1998	2.	15.	0.077002	1.100186	14.287727
1999	26.	20.	1.455874	0.869515	0.597246
2000	53.	39.	1.598323	0.908901	0.568660
2001	73.	51.	1.207716	0.680871	0.563767
2002	67.	125.	0.247970	0.519636	2.095560
2003	246.	257.	0.455602	0.481929	1.057786
2004	424.	471.	0.450762	0.515088	1.142705
2005	1312.	650.	1.510305	0.497472	0.329385
2006	605.	826.	0.273436	0.394353	1.442211
2007	1072.	1253.	N/A	N/A	

Warning \*\*\*\* Infeasible Mass Balance in Plus Group

Year = 1993

Year = 2005

**ASAP BASE RUN (F08 BASE T5.REP)**

Age Structured Assessment Program (ASAP) Version 2.0  
Start time for run: Thu Mar 20 13:54:36 2008

obj\_fun = 2432.1

Component	Lambda	obj_fun
__Catch_Fleet_1	10	2043.75
Catch_Fleet_Total	10	2043.75
Discard_Fleet_Total	0	0
__Index_Fit_1	1	60.3058
__Index_Fit_2	1	41.137
__Index_Fit_3	1	29.3885
__Index_Fit_4	1	24.6812
__Index_Fit_5	1	1.52122
__Index_Fit_6	1	18.1862
__Index_Fit_7	1	2.50131
__Index_Fit_8	1	-6.82516
__Index_Fit_9	1	-49.274
__Index_Fit_10	1	-36.0871
__Index_Fit_11	1	11.1283
__Index_Fit_12	1	-7.49735
__Index_Fit_13	1	-37.3766
__Index_Fit_14	1	26.59
__Index_Fit_15	1	-16.7199
__Index_Fit_16	1	10.2498
__Index_Fit_17	1	-24.5756
__Index_Fit_18	1	-5.86537
__Index_Fit_19	1	-33.9867
__Index_Fit_20	1	-46.5534
__Index_Fit_21	1	16.2196
__Index_Fit_22	1	-1.02528
__Index_Fit_23	1	-36.1572
__Index_Fit_24	1	-48.7597
__Index_Fit_25	1	9.03927
__Index_Fit_26	1	-12.5549
__Index_Fit_27	1	3.06733
__Index_Fit_28	1	9.92303
__Index_Fit_29	1	43.3967
__Index_Fit_30	1	29.4228
__Index_Fit_31	1	-4.5913
__Index_Fit_32	1	-10.0133
__Index_Fit_33	1	-21.8198
__Index_Fit_34	1	19.6959
__Index_Fit_35	1	73.8095
__Index_Fit_36	1	19.844
__Index_Fit_37	1	-2.64469
__Index_Fit_38	1	-4.71552
__Index_Fit_39	1	-31.8191
Index_Fit_Total	39	11.2457
Catch_Age_Comps	see_below	308.56
Discard_Age_Comps	see_below	0
Survey_Age_Comps	see_below	0
__Sel_Param_1	1	0.863394
__Sel_Param_2	1	3.3608

__Sel_Param_3	1	1.03693
__Sel_Param_4	1	2.20092
Sel_Params_Total	4	7.46205
Index_Sel_Params_Total	0	0
q_year1_Total	0	0
q_devs_Total	390000	0
__Fmult_year1_fleet_1	1	0.659681
Fmult_year1_fleet_Total	1	0.659681
Fmult_devs_fleet_Total	0	0
N_year_1	1	60.4297
Recruit_devs	0	0
SRR_steepness	0	0
SRR_unexpl_stock	0	0
Fmult_Max_penalty	1000	0
F_penalty	0	0

Input and Estimated effective sample sizes for fleet 1

1982	31	28.7442
1983	33	23.4986
1984	43	15.9284
1985	379	521.988
1986	39	30.8231
1987	46	24.0466
1988	663	3022.23
1989	92	422.065
1990	2270	2540.09
1991	58	35.5184
1992	173	610.607
1993	415	226.366
1994	106	74.3798
1995	75	147.862
1996	222	65.0925
1997	267	240.79
1998	151	245.995
1999	187	228.668
2000	125	155.017
2001	215	168.078
2002	61	77.8285
2003	236	685.159
2004	139	176.307
2005	368	736.875
2006	194	210.521
Total	6588	10714.5

Input and Estimated effective Discard sample sizes for fleet 1

1982	0	1e+15
1983	0	1e+15
1984	0	1e+15
1985	0	1e+15
1986	0	1e+15
1987	0	1e+15
1988	0	1e+15
1989	0	1e+15
1990	0	1e+15
1991	0	1e+15
1992	0	1e+15
1993	0	1e+15

1994	0	1e+15
1995	0	1e+15
1996	0	1e+15
1997	0	1e+15
1998	0	1e+15
1999	0	1e+15
2000	0	1e+15
2001	0	1e+15
2002	0	1e+15
2003	0	1e+15
2004	0	1e+15
2005	0	1e+15
2006	0	1e+15
Total	0	2.5e+16

Observed and predicted total fleet catch by year and standardized residual  
fleet 1 total catches

1982	18963	19367.1	-0.211396
1983	26466	25834.1	0.242253
1984	26057	25525.9	0.206445
1985	20432	20682.4	-0.122114
1986	20866	20991.6	-0.0601668
1987	18312	18204.7	0.0589384
1988	21761	21474.1	0.133067
1989	10314	9969.74	0.340321
1990	7976	7517.96	0.5929
1991	11316	11128.7	0.167288
1992	11805	12112.1	-0.257497
1993	10781	11199.4	-0.381715
1994	12182	12337.4	-0.1271
1995	10495	9883.26	0.602067
1996	11643	11489.9	0.132658
1997	10325	10533.6	-0.200542
1998	11641	11695.6	-0.0469193
1999	10851	10769.8	0.0753135
2000	13756	13901.1	-0.105196
2001	11932	12097.7	-0.138288
2002	11308	11564	-0.224434
2003	12927	13324.6	-0.303678
2004	13832	14177.2	-0.247146
2005	13444	13500	-0.041658
2006	12853	12857.6	-0.00360121

Observed and predicted total fleet Discards by year and standardized residual  
fleet 1 total Discards

1982	0	0	0
1983	0	0	0
1984	0	0	0
1985	0	0	0
1986	0	0	0
1987	0	0	0
1988	0	0	0
1989	0	0	0
1990	0	0	0
1991	0	0	0
1992	0	0	0
1993	0	0	0
1994	0	0	0



1995 0 0 0  
 1996 0 0 0  
 1997 0 0 0  
 1998 0 0 0  
 1999 0 0 0  
 2000 0 0 0  
 2001 0 0 0  
 2002 0 0 0  
 2003 0 0 0  
 2004 0 0 0  
 2005 0 0 0  
 2006 0 0 0

Index data

index number 1

units = 2

month = 1

starting and ending ages for selectivity = 2 2

selectivity choice = -1

year, obs index, pred index, standardized residual

1992 7.15 3.16304 2.77823  
 1993 6.5 3.24178 2.3698  
 1994 3.76 3.64624 0.104657  
 1995 6.07 4.36675 1.12188  
 1996 22.17 4.91778 5.12972  
 1997 3.86 3.52732 0.307016  
 1998 1.68 3.59798 -2.59428  
 1999 2.11 3.92443 -2.11382  
 2000 0.7 3.03344 -4.99513  
 2001 3.07 3.79754 -0.724475  
 2002 2.77 3.57498 -0.86903  
 2003 8.17 4.03331 2.40455  
 2004 1.45 2.87259 -2.32883  
 2005 2.96 4.33083 -1.29639  
 2006 2.64 2.14577 0.706093

index number 2

units = 2

month = 1

starting and ending ages for selectivity = 3 3

selectivity choice = -1

year, obs index, pred index, standardized residual

1992 4.74 3.85823 0.701143  
 1993 6.7 3.14297 2.57848  
 1994 7.2 3.53907 2.41932  
 1995 4.59 4.14529 0.347144  
 1996 8.33 7.8728 0.192293  
 1997 4.8 9.25791 -2.23757  
 1998 3.25 7.14545 -2.68368  
 1999 4.8 7.36054 -1.45632  
 2000 6.52 8.20581 -0.783374  
 2001 5.33 6.29553 -0.567136  
 2002 10.74 8.08377 0.967831  
 2003 14.36 7.71695 2.1155  
 2004 8.68 8.73891 -0.0230396  
 2005 4.03 6.20619 -1.47084  
 2006 9.06 9.32924 -0.0997554

index number 3

```

units = 2
month = 1
starting and ending ages for selectivity = 4 4
selectivity choice = -1
  year, obs index, pred index, standardized residual
1992 0.33 0.43957 -0.976644
1993 0.31 0.565482 -2.04764
1994 0.82 0.545626 1.38769
1995 0.25 0.660864 -3.31137
1996 0.6 0.885932 -1.32753
1997 1.04 2.04526 -2.3038
1998 2.29 3.34906 -1.29489
1999 2.9 2.70213 0.240733
2000 4.96 3.07227 1.63166
2001 6.42 3.31135 2.25528
2002 5.58 2.84875 2.29019
2003 8.48 3.89589 2.6495
2004 4.56 3.78241 0.636878
2005 3.07 4.22825 -1.09044
2006 4.29 2.96325 1.26039

```

```

index number 4
units = 2
month = 1
starting and ending ages for selectivity = 5 5
selectivity choice = -1
  year, obs index, pred index, standardized residual
1992 0.04 0.0405787 -0.048931
1993 0.05 0.0770519 -1.47314
1994 0.26 0.118014 2.69068
1995 0.02 0.122756 -6.18089
1996 0.12 0.117134 0.0823584
1997 0.43 0.204667 2.52895
1998 0.42 0.740608 -1.9322
1999 0.84 1.288 -1.45608
2000 2.51 1.18823 2.54742
2001 2.44 1.29046 2.16992
2002 2.26 1.62483 1.124
2003 2.67 1.5227 1.91305
2004 1.64 2.13066 -0.891596
2005 1.34 2.03259 -1.41926
2006 2.47 2.23162 0.345716

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index number 5
units = 2
month = 1
starting and ending ages for selectivity = 6 8
selectivity choice = -1
  year, obs index, pred index, standardized residual
1992 0.04 0.0369633 0.268951
1993 0.04 0.0164468 3.02749
1994 0.01 0.0263973 -3.30656
1996 0.03 0.0371273 -0.726099
1997 0.15 0.0455082 4.06302
1998 0.12 0.11962 0.0107914
1999 0.41 0.444185 -0.272805
2000 1.08 0.984701 0.314683
2001 1.34 1.09454 0.689259
2002 1.33 1.40645 -0.190374

```

```

2003  1.96  1.94811  0.0207343
2004  1.44  2.19696  -1.43899
2005  1.49  2.74884  -2.08612
2006  2.6   2.9017  -0.37398
index number 6
units = 2
month = 1
starting and ending ages for selectivity = 2  2
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982  0.7   0.607028  0.369901
1983  0.32  0.590939  -1.59218
1984  0.17  0.94034  -4.43979
1985  0.55  0.411521  0.752903
1986  1.48  0.546534  2.58583
1987  0.47  0.659924  -0.880957
1988  0.6   0.484104  0.557113
1989  0.06  0.132534  -2.05708
1990  0.63  0.266326  2.23489
1991  0.79  0.385753  1.86069
1992  0.77  0.308088  2.37767
1993  0.73  0.315757  2.17538
1994  0.35  0.355153  -0.0379369
1995  0.79  0.425332  1.60716
1996  1.08  0.479005  2.11031
1997  0.29  0.34357  -0.439999
1998  0.27  0.350452  -0.676965
1999  0.22  0.38225  -1.43398
2000  0.19  0.295465  -1.14607
2001  0.48  0.369891  0.676383
2002  0.34  0.348212  -0.0619517
2003  0.54  0.392855  0.825764
2004  0.3   0.279798  0.180959
2005  0.26  0.421834  -1.25613
2006  0.04  0.209003  -4.29191
index number 7
units = 2
month = 1
starting and ending ages for selectivity = 3  3
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982  1.43  0.880047  1.26009
1983  0.39  0.779923  -1.79894
1984  0.33  0.603862  -1.56846
1985  1.56  0.927726  1.34899
1986  0.43  0.416326  0.0838841
1987  0.43  0.481866  -0.295598
1988  0.81  0.701762  0.372326
1989  0.23  0.381867  -1.316
1990  0.03  0.121554  -3.6318
1991  0.27  0.293617  -0.217657
1992  0.41  0.364524  0.305163
1993  0.5   0.296946  1.3525
1994  0.53  0.33437  1.19566
1995  0.27  0.391645  -0.965425
1996  0.56  0.743818  -0.736814
1997  0.67  0.874683  -0.691971

```

1998	0.52	0.675099	-0.677555
1999	0.74	0.69542	0.161282
2000	1.03	0.77528	0.737409
2001	0.89	0.594799	1.04606
2002	0.89	0.76375	0.397091
2003	1.29	0.729094	1.48109
2004	1.45	0.825648	1.46177
2005	0.65	0.586357	0.267468
2006	1.04	0.881422	0.429431

index number 8  
units = 2  
month = 1  
starting and ending ages for selectivity = 4 4  
selectivity choice = -1

year,	obs	index,	pred	index,	standardized	residual
1982	0.12	0.0954294	0.594687			
1983	0.19	0.218937	-0.367963			
1984	0.09	0.128517	-0.924729			
1985	0.21	0.0934103	2.10279			
1986	0.2	0.15014	0.744309			
1987	0.02	0.0526082	-2.5104			
1988	0.07	0.0853021	-0.513178			
1989	0.02	0.0725865	-3.34597			
1990	0.06	0.0518028	0.381311			
1992	0.01	0.0420305	-3.72693			
1993	0.04	0.0540699	-0.782337			
1994	0.04	0.0521713	-0.689555			
1995	0.02	0.0631901	-2.98613			
1996	0.12	0.0847105	0.903956			
1997	0.09	0.195563	-2.01444			
1998	0.32	0.320228	-0.00185237			
1999	0.48	0.258371	1.60775			
2000	0.63	0.293762	1.98039			
2001	1.02	0.316623	3.03657			
2002	0.74	0.27239	2.59418			
2003	0.59	0.372515	1.19362			
2004	0.85	0.361664	2.21808			
2005	0.58	0.404294	0.936747			
2006	0.24	0.283338	-0.430888			

index number 9  
units = 2  
month = 1  
starting and ending ages for selectivity = 5 5  
selectivity choice = -1

year,	obs	index,	pred	index,	standardized	residual
1982	0.02	0.0237056	-0.441214			
1983	0.03	0.0319525	-0.163664			
1984	0.05	0.0479511	0.108608			
1985	0.04	0.0263726	1.08124			
1986	0.02	0.0200818	-0.0106003			
1987	0.01	0.0250139	-2.37985			
1988	0.02	0.0124052	1.23975			
1989	0.01	0.0115623	-0.376812			
1991	0.02	0.0130602	1.10618			
1994	0.01	0.012651	-0.610384			
1997	0.01	0.0219401	-2.03952			
1998	0.06	0.0793926	-0.726951			

```

1999  0.13  0.138073  -0.156383
2000  0.12  0.127377  -0.154853
2001  0.2   0.138336  0.956859
2002  0.31  0.17418   1.49637
2003  0.29  0.163232  1.49177
2004  0.27  0.228405  0.43426
2005  0.15  0.217891  -0.969134
2006  0.25  0.239228  0.114322
index number 10
units = 2
month = 1
starting and ending ages for selectivity = 6 8
selectivity choice = -1
  year, obs index, pred index, standardized residual
1983  0.02  0.0188945  0.147593
1984  0.02  0.01364   0.99344
1985  0.02  0.0165861  0.485823
1986  0.01  0.0112334  -0.301895
1992  0.01  0.00445949 2.09615
1995  0.01  0.0052904  1.65266
1998  0.02  0.0144318  0.846975
1999  0.03  0.0535894  -1.5059
2000  0.17  0.118801  0.930172
2001  0.1   0.132052  -0.721667
2002  0.19  0.169683  0.29356
2003  0.2   0.235032  -0.418957
2004  0.16  0.265055  -1.31021
2005  0.17  0.331637  -1.73456
2006  0.2   0.35008   -1.45318
index number 11
units = 2
month = 1
starting and ending ages for selectivity = 3 3
selectivity choice = -1
  year, obs index, pred index, standardized residual
1983  1.52  1.42787   0.112763
1984  1.46  1.10554   0.501528
1985  1.39  1.69846  -0.361433
1986  0.8   0.762201  0.0872867
1987  0.83  0.882189  -0.109972
1988  0.58  1.28477  -1.43425
1989  0.62  0.699114  -0.216576
1990  0.21  0.222539  -0.104585
1991  0.38  0.537547  -0.625495
1992  0.84  0.667363  0.414901
1993  1.04  0.543643  1.16982
1994  0.8   0.612157  0.482628
1995  0.67  0.717015  -0.122304
1996  1.16  1.36177  -0.289196
1997  1.24  1.60135  -0.461191
1998  1.29  1.23596  0.0771791
1999  2.13  1.27316  0.928057
2000  1.73  1.41937  0.356908
2001  1.2   1.08894  0.175131
2002  1.36  1.39826  -0.0500306
2003  1.17  1.33481  -0.237659
2004  1.31  1.51158  -0.258113

```

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2005  1.49  1.07349  0.591258
2006  1.14  1.61369  -0.626666
index number 12
units = 2
month = 1
starting and ending ages for selectivity = 4  4
selectivity choice = -1
  year, obs index, pred index, standardized residual
1983  0.4  0.556078  -0.594114
1984  0.34  0.326422  0.0734985
1985  0.43  0.237253  1.0724
1986  0.46  0.381342  0.338191
1987  0.11  0.13362  -0.350788
1988  0.2  0.216659  -0.144283
1989  0.18  0.184363  -0.0431863
1990  0.05  0.131574  -1.74486
1991  0.03  0.0583192  -1.19877
1992  0.09  0.106753  -0.307859
1993  0.25  0.137332  1.08033
1994  0.03  0.13251  -2.67886
1995  0.09  0.160497  -1.04319
1996  0.28  0.215156  0.475055
1997  0.57  0.49671  0.2482
1998  1.14  0.813349  0.608865
1999  1.63  0.656236  1.64074
2000  1.49  0.746127  1.24729
2001  1.22  0.804191  0.751596
2002  0.93  0.691844  0.533485
2003  0.86  0.946152  -0.172171
2004  1.03  0.918591  0.20644
2005  1.37  1.02687  0.519911
2006  0.54  0.71965  -0.517925
index number 13
units = 2
month = 1
starting and ending ages for selectivity = 5  5
selectivity choice = -1
  year, obs index, pred index, standardized residual
1983  0.03  0.0677471  -1.46901
1984  0.12  0.101668  0.298961
1985  0.07  0.0559165  0.405105
1986  0.05  0.0425785  0.289758
1987  0.11  0.0530356  1.3156
1988  0.03  0.026302  0.237238
1989  0.03  0.024515  0.364124
1991  0.04  0.0276909  0.66324
1993  0.03  0.017513  0.970676
1994  0.01  0.0268233  -1.77937
1995  0.01  0.027901  -1.85041
1996  0.02  0.0266231  -0.515854
1997  0.04  0.0465185  -0.272259
1998  0.29  0.168332  0.980939
1999  0.33  0.292749  0.216007
2000  0.31  0.27007  0.248669
2001  0.4  0.293306  0.559496
2002  0.37  0.369305  0.00338905
2003  0.35  0.346091  0.0202528

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2004  0.25  0.484276  -1.19239
2005  0.66  0.461984  0.643286
2006  0.47  0.507223  -0.13745
index number 14
units = 2
month = 1
starting and ending ages for selectivity = 3  3
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982  1.584  0.954509  0.913434
1983  0.599  0.845914  -0.622449
1984  0.078  0.654956  -3.83735
1985  1.26  1.00622  0.405596
1986  0.522  0.451552  0.261448
1987  0.64  0.522637  0.365331
1988  1.005  0.76114  0.501207
1989  0.363  0.414177  -0.237851
1990  0.021  0.131839  -3.31292
1991  0.05  0.31846  -3.33892
1992  0.342  0.395367  -0.261498
1993  0.492  0.322072  0.764103
1994  1.217  0.362661  2.18331
1995  1.302  0.424783  2.01993
1996  0.686  0.806754  -0.292404
1997  1.279  0.948692  0.53876
1998  1.212  0.73222  0.908807
1999  0.878  0.754261  0.273949
2000  1.659  0.840879  1.22544
2001  1.026  0.645126  0.83673
2002  1.511  0.828373  1.08395
2003  1.44  0.790784  1.0809
2004  0.283  0.895507  -2.0774
2005  0.351  0.63597  -1.07187
2006  2.44  0.956001  1.68976
index number 15
units = 2
month = 1
starting and ending ages for selectivity = 4  4
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982  0.142  0.126831  0.203737
1983  0.45  0.290978  0.786275
1984  0.067  0.170806  -1.68767
1985  0.036  0.124147  -2.23249
1986  0.185  0.199544  -0.136479
1987  0.013  0.0699189  -3.03399
1988  0.123  0.113371  0.147013
1989  0.102  0.0964711  0.100501
1990  0.081  0.0688485  0.293123
1991  0.012  0.0305166  -1.68321
1992  0.09  0.0558607  0.860121
1993  0.065  0.0718616  -0.180979
1994  0.048  0.0693383  -0.663279
1995  0.053  0.0839829  -0.830136
1996  0.114  0.112585  0.0225302
1997  0.181  0.259913  -0.652552
1998  0.659  0.4256  0.788482

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1999  1.112  0.343388  2.11907
2000  1.205  0.390425  2.03241
2001  0.73   0.420808  0.993427
2002  0.397  0.36202   0.166338
2003  0.624  0.495092  0.417316
2004  0.323  0.48067  -0.716896
2005  1.029  0.537328  1.17172
2006  0.975  0.37657   1.71562
index number 16
units = 2
month = 1
starting and ending ages for selectivity = 4  4
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982  0.405  0.479015  -0.302689
1983  1.662  1.09897   0.745968
1984  0.625  0.645103  -0.0570911
1985  0.267  0.46888  -1.01548
1986  1.895  0.75364   1.66283
1987  0.679  0.264071  1.70312
1988  0.663  0.42818   0.788496
1989  0.429  0.364353  0.294552
1990  0.317  0.260028  0.357274
1992  0.288  0.210975  0.561248
1993  0.186  0.271408  -0.681455
1994  0.478  0.261878  1.08516
1995  0.076  0.317187  -2.5766
1996  0.506  0.425211  0.313701
1997  1.282  0.981641  0.481415
1998  1.508  1.60741  -0.115128
1999  0.59   1.29691  -1.42038
2000  0.94   1.47456  -0.811947
2001  2.303  1.58931  0.668896
2002  1.083  1.36728  -0.42035
2003  1.302  1.86987  -0.652764
2004  1.254  1.8154  -0.667192
2005  1.455  2.02939  -0.600035
2006  2.049  1.42223  0.658456
index number 17
units = 2
month = 1
starting and ending ages for selectivity = 5  5
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982  0.012  0.0428687  -2.29613
1983  0.02   0.0577822  -1.9133
1984  0.154  0.0867138  1.03576
1985  0.127  0.0476917  1.76629
1986  0.04   0.0363156  0.174265
1987  0.214  0.0452346  2.80267
1988  0.011  0.0224333  -1.28518
1989  0.006  0.0209091  -2.25139
1990  0.016  0.0235281  -0.6954
1991  0.011  0.0236179  -1.37798
1992  0.006  0.00786646  -0.488444
1994  0.03   0.0228778  0.488769
1997  0.114  0.0396761  1.90338

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1998 0.351 0.143572 1.61214
1999 0.262 0.249688 0.0868004
2000 0.379 0.230346 0.898006
2001 0.494 0.250164 1.22706
2002 0.307 0.314984 -0.0463011
2003 0.178 0.295185 -0.912184
2004 0.256 0.413044 -0.862695
2005 0.136 0.39403 -1.91839
2006 1.35 0.432615 2.05227
index number 18
units = 2
month = 1
starting and ending ages for selectivity = 3 3
selectivity choice = -1
year, obs index, pred index, standardized residual
1984 0.271 0.286586 -0.100845
1985 0.325 0.440288 -0.547514
1986 0.1 0.197583 -1.22809
1987 0.086 0.228688 -1.76373
1988 0.223 0.333048 -0.723364
1989 0.049 0.181229 -2.35873
1990 0.022 0.0576881 -1.73848
1991 0.189 0.139347 0.549635
1992 0.188 0.172999 0.149965
1993 0.151 0.140927 0.124499
1994 0.314 0.158688 1.23073
1995 0.051 0.18587 -2.33218
1996 0.266 0.353007 -0.510344
1997 0.507 0.415114 0.3606
1998 0.594 0.320394 1.11328
1999 0.593 0.330038 1.05676
2000 0.726 0.367939 1.22564
2001 0.34 0.282284 0.335485
2002 1.264 0.362467 2.25261
2003 1.016 0.346019 1.94249
2004 0.818 0.391843 1.32729
2005 0.264 0.278278 -0.0949888
2006 0.36 0.418312 -0.270732
index number 19
units = 2
month = 1
starting and ending ages for selectivity = 4 4
selectivity choice = -1
year, obs index, pred index, standardized residual
1984 0.044 0.0756012 -0.976141
1985 0.04 0.0549492 -0.572629
1986 0.082 0.088321 -0.133917
1987 0.014 0.0309471 -1.43048
1988 0.035 0.0501795 -0.649685
1989 0.024 0.0426995 -1.03899
1990 0.013 0.0304733 -1.53631
1991 0.029 0.0135071 1.37793
1992 0.021 0.0247247 -0.29446
1993 0.015 0.031807 -1.35549
1994 0.025 0.0306901 -0.369811
1995 0.02 0.037172 -1.11778
1996 0.086 0.0498315 0.984105

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1997 0.057 0.115041 -1.2664
1998 0.503 0.188377 1.77119
1999 0.385 0.151988 1.67614
2000 0.524 0.172807 2.00052
2001 0.365 0.186255 1.21328
2002 0.465 0.160235 1.92132
2003 0.395 0.219135 1.06255
2004 0.41 0.212751 1.18308
2005 0.15 0.237829 -0.831209
2006 0.068 0.166675 -1.61681
index number 20
units = 2
month = 1
starting and ending ages for selectivity = 5 5
selectivity choice = -1
year, obs index, pred index, standardized residual
1985 0.058 0.022186 1.73302
1986 0.008 0.0168939 -1.34805
1987 0.004 0.021043 -2.99411
1988 0.009 0.0104359 -0.266944
1989 0.016 0.00972683 0.897545
1990 0.006 0.0109452 -1.08409
1991 0.028 0.0109869 1.68706
1992 0.004 0.00365945 0.160469
1993 0.018 0.00694865 1.7165
1994 0.018 0.0106427 0.947676
1995 0.005 0.0110703 -1.43338
1996 0.023 0.0105633 1.40323
1997 0.036 0.0184572 1.20478
1998 0.116 0.0667891 0.995559
1999 0.139 0.116154 0.32381
2000 0.074 0.107156 -0.667648
2001 0.12 0.116375 0.0553137
2002 0.233 0.146529 0.836431
2003 0.232 0.137319 0.945752
2004 0.194 0.192146 0.0173143
2005 0.033 0.183301 -3.09213
2006 0.065 0.201251 -2.03812
index number 21
units = 2
month = 1
starting and ending ages for selectivity = 3 3
selectivity choice = -1
year, obs index, pred index, standardized residual
1985 0.571 1.10752 -1.19472
1986 0.339 0.497009 -0.689988
1987 1.17 0.57525 1.28032
1988 1.067 0.837762 0.436189
1989 0.884 0.455872 1.19428
1990 0.029 0.145111 -2.90381
1991 0.674 0.350519 1.17908
1992 0.826 0.435168 1.15572
1993 0.57 0.354494 0.85651
1994 0.827 0.399169 1.31362
1995 0.3 0.467544 -0.800183
1996 0.384 0.887968 -1.51176
1997 0.887 1.04419 -0.294233

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1998  0.681  0.805931  -0.303755
1999  0.269  0.83019  -2.03231
2000  0.679  0.925528  -0.558585
2001  0.395  0.710069  -1.05764
2002  2.689  0.911763  1.95044
2003  3.087  0.87039  2.28311
2004  1.459  0.985656  0.707286
2005  0.385  0.699992  -1.07811
2006  1.093  1.05224  0.0685397
index number 22
units = 2
month = 1
starting and ending ages for selectivity = 4 4
selectivity choice = -1
  year, obs index, pred index, standardized residual
1985  0.331  0.337018  -0.0324959
1986  0.528  0.541697  -0.0461848
1987  0.298  0.189807  0.813481
1988  0.223  0.307765  -0.580984
1989  0.481  0.261888  1.09637
1990  0.095  0.186901  -1.22036
1991  0.11  0.0828426  0.511329
1992  0.34  0.151644  1.45608
1993  0.366  0.195081  1.13472
1994  0.152  0.188231  -0.385543
1995  0.085  0.227986  -1.77928
1996  0.117  0.30563  -1.73161
1997  1.188  0.705578  0.93958
1998  1.373  1.15536  0.311232
1999  1.054  0.932186  0.221484
2000  1.484  1.05987  0.607001
2001  0.871  1.14236  -0.489088
2002  1.137  0.982766  0.262893
2003  1.93  1.34401  0.652574
2004  1.319  1.30486  0.0194359
2005  0.755  1.45867  -1.18764
2006  0.744  1.02227  -0.572998
index number 23
units = 2
month = 1
starting and ending ages for selectivity = 5 5
selectivity choice = -1
  year, obs index, pred index, standardized residual
1985  0.072  0.0683598  0.0935607
1986  0.075  0.0520536  0.65862
1987  0.072  0.0648378  0.188953
1988  0.033  0.0321551  0.0467722
1989  0.037  0.0299704  0.379984
1990  0.015  0.0337245  -1.46106
1991  0.042  0.0338531  0.38888
1992  0.036  0.0112755  2.09352
1993  0.046  0.0214103  1.37917
1994  0.039  0.0327924  0.312645
1995  0.024  0.0341099  -0.633952
1996  0.012  0.0325477  -1.79942
1997  0.042  0.0568705  -0.546618
1998  0.373  0.205791  1.0725

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1999  0.321  0.357895  -0.196206
2000  0.346  0.33017  0.084454
2001  0.341  0.358577  -0.0906388
2002  0.436  0.451488  -0.0629518
2003  0.479  0.423109  0.223749
2004  0.407  0.592044  -0.675849
2005  0.44  0.564791  -0.450271
2006  0.355  0.620097  -1.00585
index number 24
units = 2
month = 1
starting and ending ages for selectivity = 6 8
selectivity choice = -1
  year, obs index, pred index, standardized residual
1985  0.025  0.0190733  0.487974
1986  0.009  0.0129179  -0.65172
1987  0.007  0.0073911  -0.0980446
1988  0.003  0.0112748  -2.38761
1989  0.003  0.0040968  -0.561922
1990  0.001  0.00406497  -2.52908
1991  0.012  0.00631831  1.15679
1992  0.022  0.0051282  2.62625
1993  0.025  0.00228178  4.31715
1994  0.007  0.0036623  1.16827
1995  0.009  0.00608371  0.706223
1996  0.005  0.00515095  -0.0536377
1997  0.005  0.0063137  -0.420702
1998  0.04  0.0165959  1.58648
1999  0.075  0.0616252  0.354215
2000  0.127  0.136615  -0.131611
2001  0.191  0.151853  0.413621
2002  0.134  0.195127  -0.67773
2003  0.183  0.270276  -0.703241
2004  0.203  0.304801  -0.732988
2005  0.119  0.381367  -2.10029
2006  0.151  0.402575  -1.7684
index number 25
units = 2
month = 1
starting and ending ages for selectivity = 4 4
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982  1.74  0.334045  2.97624
1983  0.52  0.766374  -0.699428
1984  0.42  0.449867  -0.123888
1985  0.49  0.326977  0.729498
1986  0.28  0.525557  -1.13553
1987  0.51  0.184152  1.83702
1988  0.37  0.298595  0.386675
1989  0.24  0.254084  -0.102843
1990  0.07  0.181332  -1.71653
1991  0.12  0.0803742  0.722793
1992  0.08  0.147125  -1.09873
1993  0.41  0.189268  1.394
1994  0.22  0.182622  0.335802
1995  0.03  0.221193  -3.60287
1996  0.2  0.296524  -0.710192

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1997  1.03  0.684555  0.736764
1998  0.96  1.12094  -0.279505
1999  0.36  0.904411  -1.66124
2000  1.91  1.0283  1.11666
2001  1.24  1.10832  0.202462
2002  0.63  0.953484  -0.747327
2003  1.38  1.30397  0.102203
2004  2.08  1.26598  0.895416
2005  1.3  1.41521  -0.153128
2006  1.38  0.991806  0.595678
index number 26
units = 2
month = 1
starting and ending ages for selectivity = 5 5
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982  0.2  0.0551176  2.32429
1983  0.07  0.0742923  -0.107322
1984  0.11  0.11149  -0.0242702
1985  0.1  0.0613186  0.88201
1986  0.02  0.046692  -1.52898
1987  0.13  0.0581594  1.45055
1988  0.02  0.0288431  -0.660287
1992  0.01  0.0101141  -0.020466
1993  0.11  0.019205  3.14747
1994  0.07  0.0294147  1.56354
1997  0.01  0.0510127  -2.9386
1998  0.03  0.184595  -3.27668
1999  0.09  0.321031  -2.29342
2000  0.35  0.296162  0.301213
2001  0.45  0.321643  0.605588
2002  0.3  0.404984  -0.541134
2003  0.4  0.379528  0.0947449
2004  0.49  0.531062  -0.145125
2005  0.78  0.506616  0.778232
2006  0.69  0.556226  0.388659
index number 27
units = 2
month = 1
starting and ending ages for selectivity = 2 2
selectivity choice = -1
  year, obs index, pred index, standardized residual
1990  0.17  0.196744  -0.26348
1991  0.07  0.284968  -2.53174
1992  0.15  0.227595  -0.751887
1993  0.11  0.23326  -1.35556
1994  0.08  0.262363  -2.14188
1995  0.2  0.314207  -0.814649
1996  0.41  0.353856  0.265577
1997  0.17  0.253807  -0.722749
1998  0.07  0.25889  -2.35866
1999  0.26  0.28238  -0.14891
2000  0.63  0.218269  1.91157
2001  0.42  0.27325  0.775216
2002  0.81  0.257236  2.06856
2003  1.48  0.290215  2.93803
2004  0.54  0.206696  1.73183

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2005  0.55  0.311622  1.02455
2006  0.19  0.154398  0.37419
index number 28
units = 2
month = 1
starting and ending ages for selectivity = 3  8
selectivity choice = -1
  year, obs index, pred index, standardized residual
1990  0.1  0.103487  -0.0618175
1991  0.08  0.249976  -2.05466
1992  0.18  0.310344  -0.982347
1993  0.14  0.252811  -1.0658
1994  0.05  0.284672  -3.13665
1995  0.22  0.333434  -0.749877
1996  0.53  0.633263  -0.321019
1997  0.52  0.744677  -0.647635
1998  0.36  0.574758  -0.843703
1999  0.61  0.592058  0.0538383
2000  1.89  0.660049  1.89719
2001  0.55  0.506393  0.148971
2002  1.11  0.650233  0.964423
2003  2.25  0.620727  2.32239
2004  1.53  0.70293  1.40261
2005  1.89  0.499206  2.40087
2006  1.09  0.750414  0.673217
index number 29
units = 2
month = 1
starting and ending ages for selectivity = 2  2
selectivity choice = -1
  year, obs index, pred index, standardized residual
1988  3.06  5.42727  -1.03338
1989  0.51  1.48584  -1.9284
1990  1.44  2.98577  -1.31505
1991  2.69  4.32465  -0.856231
1992  3  3.45396  -0.254115
1993  5.69  3.53994  0.855886
1994  1.07  3.9816  -2.36969
1995  2.93  4.76838  -0.878256
1996  5.1  5.3701  -0.0930659
1997  8.25  3.85175  1.37361
1998  5.8  3.92891  0.702413
1999  6.12  4.28538  0.64264
2000  3.91  3.31244  0.299095
2001  3.32  4.14683  -0.401034
2002  9.11  3.90379  1.52823
2003  5.61  4.40428  0.436372
2004  6.27  3.1368  1.24898
2005  5.99  4.72916  0.426219
2006  5.74  2.34313  1.61578
index number 30
units = 2
month = 1
starting and ending ages for selectivity = 3  3
selectivity choice = -1
  year, obs index, pred index, standardized residual
1988  1.03  1.28013  -0.392065

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1989	0.18	0.69659	-2.44041
1990	0.11	0.221735	-1.26418
1991	0.27	0.535607	-1.23528
1992	0.57	0.664953	-0.277866
1993	0.2	0.54168	-1.79682
1994	0.08	0.609947	-3.6633
1995	0.28	0.714426	-1.68921
1996	2.7	1.35685	1.24088
1997	5.25	1.59557	2.14782
1998	2.67	1.23149	1.39555
1999	3.46	1.26856	1.80949
2000	1.82	1.41424	0.45489
2001	1.18	1.08501	0.151344
2002	4.13	1.39321	1.95968
2003	2.55	1.32999	1.17386
2004	2.49	1.50612	0.906643
2005	1.24	1.06962	0.266563
2006	3.22	1.60786	1.25241

index number 31  
units = 2  
month = 1  
starting and ending ages for selectivity = 4 4  
selectivity choice = -1

year	obs index	pred index	standardized residual
1990	0.03	0.0703169	-1.53615
1991	0.02	0.0311674	-0.800056
1992	0.06	0.0570521	0.0908548
1993	0.01	0.0733942	-3.59461
1995	0.05	0.085774	-0.973274
1996	0.18	0.114986	0.808184
1997	1.02	0.265456	2.42755
1998	0.29	0.434677	-0.729869
1999	0.65	0.350712	1.1127
2000	0.45	0.398751	0.218046
2001	0.41	0.429783	-0.0849794
2002	1.28	0.369741	2.23946
2003	0.57	0.505651	0.216027
2004	0.57	0.490921	0.26934
2005	0.53	0.548788	-0.06282
2006	0.48	0.384602	0.39959

index number 32  
units = 2  
month = 1  
starting and ending ages for selectivity = 5 8  
selectivity choice = -1

year	obs index	pred index	standardized residual
1992	0.02	0.0100584	1.23951
1993	0.01	0.0190992	-1.1669
1994	0.02	0.0292526	-0.685714
1995	0.16	0.030428	2.99328
1996	0.05	0.0290343	0.980218
1997	0.18	0.0507316	2.28382
1998	0.04	0.183577	-2.74792
1999	0.18	0.319262	-1.03344
2000	0.22	0.29453	-0.526144
2001	0.15	0.31987	-1.36567
2002	0.81	0.402753	1.26004

```

2003  0.51  0.377436  0.542834
2004  0.43  0.528136  -0.370719
2005  0.32  0.503825  -0.81857
2006  0.4   0.553161  -0.584631
index number 33
units = 2
month = 1
starting and ending ages for selectivity = 1  1
selectivity choice = -1
  year, obs index, pred index, standardized residual
1985  0.24  0.0902408  1.76399
1986  0.172  0.11012  0.804176
1987  0.075  0.0796273  -0.107966
1988  0.015  0.0223054  -0.715548
1990  0.032  0.0632745  -1.22945
1991  0.036  0.051137  -0.632968
1992  0.013  0.0523304  -2.51145
1993  0.084  0.0584357  0.654429
1994  0.132  0.0697654  1.14995
1995  0.023  0.0760495  -2.15665
1996  0.069  0.0543406  0.430711
1997  0.033  0.0550736  -0.923626
1999  0.044  0.0463034  -0.0920175
2000  0.012  0.058005  -2.84145
2001  0.021  0.0544841  -1.71932
2002  0.442  0.061394  3.55988
2004  0.255  0.0659176  2.43972
2005  0.067  0.0326682  1.29535
2006  0.098  0.0617742  0.832229
index number 34
units = 2
month = 1
starting and ending ages for selectivity = 1  1
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982  2.27  1.50466  0.741577
1983  5.01  2.43677  1.29981
1984  1.58  1.06929  0.704101
1985  1.26  1.41737  -0.212238
1986  1.26  1.72959  -0.571268
1987  0.39  1.25067  -2.10145
1988  0.54  0.35034  0.78026
1989  1.24  0.695903  1.04174
1990  2.54  0.993821  1.69223
1991  2.64  0.803183  2.14594
1992  0.89  0.821928  0.143494
1993  0.5   0.91782  -1.09536
1994  2.41  1.09577  1.42137
1995  0.63  1.19447  -1.15369
1996  0.81  0.8535  -0.0943377
1997  0.89  0.865013  0.0513553
1998  0.73  0.942684  -0.461101
1999  0.53  0.727263  -0.570611
2000  0.57  0.911054  -0.845726
2001  0.47  0.855753  -1.08068
2002  0.77  0.964284  -0.405753
2003  0.44  0.686553  -0.802342

```



```

2004 1.3 1.03533 0.410522
2005 0.35 0.513103 -0.689873
2006 0.8 0.970255 -0.347959
index number 35
units = 2
month = 1
starting and ending ages for selectivity = 1 1
selectivity choice = -1
year, obs index, pred index, standardized residual
1982 3.408 12.7428 -2.37838
1983 17.699 20.6369 -0.276948
1984 13.31 9.05571 0.69452
1985 12.843 12.0036 0.121899
1986 59.526 14.6478 2.52856
1987 7.584 10.5918 -0.6024
1988 1.763 2.96701 -0.938727
1989 2.855 5.89356 -1.30707
1990 4.733 8.41659 -1.03811
1991 7.337 6.8021 0.136515
1992 8.487 6.96085 0.357493
1993 4.145 7.77295 -1.13387
1994 22.311 9.27999 1.58196
1995 13.067 10.1159 0.461637
1996 6.493 7.22823 -0.193448
1997 7.997 7.32573 0.158109
1998 14.983 7.98352 1.1353
1999 8.565 6.15914 0.594661
2000 9.874 7.71565 0.444812
2001 13.543 7.24731 1.12755
2002 5.406 8.16645 -0.743941
2003 8.18 5.81437 0.615602
2004 6.993 8.76817 -0.407959
2005 2.198 4.34543 -1.22915
2006 9.658 8.21702 0.291388
index number 36
units = 2
month = 1
starting and ending ages for selectivity = 1 1
selectivity choice = -1
year, obs index, pred index, standardized residual
1988 0.17 0.482823 -1.88247
1989 1 0.959063 0.0753784
1990 1.28 1.36964 -0.122066
1991 1 1.10691 -0.183175
1992 1.1 1.13274 -0.0528985
1993 2.55 1.2649 1.26435
1994 1.66 1.51014 0.170628
1995 4.95 1.64617 1.98542
1996 1.66 1.17626 0.621232
1997 1.65 1.19212 0.586172
1998 0.67 1.29917 -1.1942
1999 1.03 1.00228 0.0491955
2000 0.95 1.25557 -0.502939
2001 0.62 1.17936 -1.15959
2002 1.51 1.32893 0.230352
2003 0.6 0.946177 -0.821442
2004 0.9 1.42685 -0.831055

```

```

2005  3.11  0.707136  2.67109
2006  0.81  1.33716  -0.903985
index number 37
units = 2
month = 1
starting and ending ages for selectivity = 1  1
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982  0.55  0.436653  0.416182
1983  0.96  0.707155  0.551266
1984  0.18  0.310308  -0.982139
1985  0.59  0.411321  0.650567
1986  0.39  0.50193  -0.45502
1987  0.07  0.362944  -2.96793
1988  0.06  0.101669  -0.951067
1989  0.31  0.201952  0.772827
1990  0.44  0.288408  0.761748
1991  0.76  0.233084  2.13145
1992  0.99  0.238524  2.56664
1993  0.23  0.266352  -0.26463
1994  0.75  0.317993  1.54738
1995  0.93  0.346636  1.77977
1996  0.11  0.247687  -1.46378
1997  0.17  0.251028  -0.702895
1998  0.38  0.273568  0.59263
1999  0.21  0.211053  -0.00901634
2000  0.22  0.264389  -0.33145
2001  0.12  0.248341  -1.31162
2002  0.06  0.279836  -2.77696
2003  0.18  0.199239  -0.183126
2004  0.36  0.300455  0.326062
2005  0.16  0.148903  0.129625
2006  0.31  0.281569  0.173475
index number 38
units = 2
month = 1
starting and ending ages for selectivity = 1  1
selectivity choice = -1
  year, obs index, pred index, standardized residual
1986  0.32  0.330346  -0.0573819
1987  0.26  0.238872  0.152842
1988  0.01  0.0669136  -3.4279
1989  0.14  0.132915  0.0936567
1990  0.36  0.189816  1.15426
1991  0.38  0.153405  1.63583
1992  0.37  0.156985  1.54614
1993  0.05  0.1753  -2.2623
1994  0.57  0.209288  1.80686
1995  0.3  0.228139  0.493815
1996  0.08  0.163015  -1.28368
1997  0.22  0.165214  0.516463
1998  0.39  0.180049  1.39387
1999  0.35  0.138904  1.66659
2000  0.21  0.174008  0.33905
2001  0.14  0.163446  -0.279231
2002  0.13  0.184174  -0.628207
2003  0.21  0.131129  0.84926

```

2004	0.27	0.197745	0.561654
2005	0.01	0.0980007	-4.11602
2006	0.17	0.185315	-0.155558

index number 39  
units = 2  
month = 1  
starting and ending ages for selectivity = 1 1  
selectivity choice = -1

year	obs index	pred index	standardized residual
1990	0.02	0.036712	-1.09532
1992	0.01	0.0303622	-2.00286
1993	0.01	0.0339045	-2.20186
1994	0.04	0.0404779	-0.0214205
1995	0.03	0.044124	-0.695757
1996	0.02	0.0315285	-0.820827
1997	0.04	0.0319538	0.405021
1999	0.03	0.0268653	0.199027
2000	0.09	0.0336545	1.77392
2001	0.01	0.0316117	-2.07559
2002	0.11	0.0356209	2.0334
2003	0.05	0.0253614	1.22412
2004	0.1	0.0382455	1.73331
2005	0.04	0.0189541	1.34687
2006	0.04	0.0358415	0.197965

Input and Estimated effective sample sizes for index 1

1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
Total	0	0

Input and Estimated effective sample sizes for index 2

1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0

2006 0 0  
 Total 0 0  
 Input and Estimated effective sample sizes for index 3  
 1992 0 0  
 1993 0 0  
 1994 0 0  
 1995 0 0  
 1996 0 0  
 1997 0 0  
 1998 0 0  
 1999 0 0  
 2000 0 0  
 2001 0 0  
 2002 0 0  
 2003 0 0  
 2004 0 0  
 2005 0 0  
 2006 0 0  
 Total 0 0  
 Input and Estimated effective sample sizes for index 4  
 1992 0 0  
 1993 0 0  
 1994 0 0  
 1995 0 0  
 1996 0 0  
 1997 0 0  
 1998 0 0  
 1999 0 0  
 2000 0 0  
 2001 0 0  
 2002 0 0  
 2003 0 0  
 2004 0 0  
 2005 0 0  
 2006 0 0  
 Total 0 0  
 Input and Estimated effective sample sizes for index 5  
 1992 0 0  
 1993 0 0  
 1994 0 0  
 1996 0 0  
 1997 0 0  
 1998 0 0  
 1999 0 0  
 2000 0 0  
 2001 0 0  
 2002 0 0  
 2003 0 0  
 2004 0 0  
 2005 0 0  
 2006 0 0  
 Total 0 0  
 Input and Estimated effective sample sizes for index 6  
 1982 0 0  
 1983 0 0  
 1984 0 0  
 1985 0 0

1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 7

1982 0 0  
1983 0 0  
1984 0 0  
1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 8

1982 0 0  
1983 0 0  
1984 0 0  
1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0

1989 0 0  
1990 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 9

1982 0 0  
1983 0 0  
1984 0 0  
1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1991 0 0  
1994 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 10

1983 0 0  
1984 0 0  
1985 0 0  
1986 0 0  
1992 0 0  
1995 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 11

1983	0	0
1984	0	0
1985	0	0
1986	0	0
1987	0	0
1988	0	0
1989	0	0
1990	0	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0

Total 0 0

Input and Estimated effective sample sizes for index 12

1983	0	0
1984	0	0
1985	0	0
1986	0	0
1987	0	0
1988	0	0
1989	0	0
1990	0	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0

Total 0 0

Input and Estimated effective sample sizes for index 13

1983	0	0
1984	0	0
1985	0	0
1986	0	0

1987 0 0  
1988 0 0  
1989 0 0  
1991 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 14

1982 0 0  
1983 0 0  
1984 0 0  
1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 15

1982 0 0  
1983 0 0  
1984 0 0  
1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0



1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 16

1982 0 0  
1983 0 0  
1984 0 0  
1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1990 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0

Total 0 0

Input and Estimated effective sample sizes for index 17

1982 0 0  
1983 0 0  
1984 0 0  
1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1994 0 0  
1997 0 0  
1998 0 0

1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 18

1984 0 0  
1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 19

1984 0 0  
1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0

2006 0 0  
 Total 0 0  
 Input and Estimated effective sample sizes for index 20  
 1985 0 0  
 1986 0 0  
 1987 0 0  
 1988 0 0  
 1989 0 0  
 1990 0 0  
 1991 0 0  
 1992 0 0  
 1993 0 0  
 1994 0 0  
 1995 0 0  
 1996 0 0  
 1997 0 0  
 1998 0 0  
 1999 0 0  
 2000 0 0  
 2001 0 0  
 2002 0 0  
 2003 0 0  
 2004 0 0  
 2005 0 0  
 2006 0 0  
 Total 0 0  
 Input and Estimated effective sample sizes for index 21  
 1985 0 0  
 1986 0 0  
 1987 0 0  
 1988 0 0  
 1989 0 0  
 1990 0 0  
 1991 0 0  
 1992 0 0  
 1993 0 0  
 1994 0 0  
 1995 0 0  
 1996 0 0  
 1997 0 0  
 1998 0 0  
 1999 0 0  
 2000 0 0  
 2001 0 0  
 2002 0 0  
 2003 0 0  
 2004 0 0  
 2005 0 0  
 2006 0 0  
 Total 0 0  
 Input and Estimated effective sample sizes for index 22  
 1985 0 0  
 1986 0 0  
 1987 0 0  
 1988 0 0  
 1989 0 0  
 1990 0 0

1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 23

1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 24

1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0

2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 25

1982 0 0  
1983 0 0  
1984 0 0  
1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 26

1982 0 0  
1983 0 0  
1984 0 0  
1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 27

1990	0	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0

Total 0 0

Input and Estimated effective sample sizes for index 28

1990	0	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0

Total 0 0

Input and Estimated effective sample sizes for index 29

1988	0	0
1989	0	0
1990	0	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0

2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 30

1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0

Total 0 0

Input and Estimated effective sample sizes for index 31

1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0

Total 0 0

Input and Estimated effective sample sizes for index 32

1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0

Total 0 0  
Input and Estimated effective sample sizes for index 33  
1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2004 0 0  
2005 0 0  
2006 0 0

Total 0 0  
Input and Estimated effective sample sizes for index 34  
1982 0 0  
1983 0 0  
1984 0 0  
1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0

Total 0 0  
Input and Estimated effective sample sizes for index 35  
1982 0 0  
1983 0 0  
1984 0 0  
1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0



1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 36

1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 37

1982 0 0  
1983 0 0  
1984 0 0  
1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0

1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 38

1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 39

1990 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Survey proportions at age by index

Index number 1  
N/A  
Index number 2  
N/A  
Index number 3

N/A  
Index number 4  
N/A  
Index number 5  
N/A  
Index number 6  
N/A  
Index number 7  
N/A  
Index number 8  
N/A  
Index number 9  
N/A  
Index number 10  
N/A  
Index number 11  
N/A  
Index number 12  
N/A  
Index number 13  
N/A  
Index number 14  
N/A  
Index number 15  
N/A  
Index number 16  
N/A  
Index number 17  
N/A  
Index number 18  
N/A  
Index number 19  
N/A  
Index number 20  
N/A  
Index number 21  
N/A  
Index number 22  
N/A  
Index number 23  
N/A  
Index number 24  
N/A  
Index number 25  
N/A  
Index number 26  
N/A  
Index number 27  
N/A  
Index number 28  
N/A  
Index number 29  
N/A  
Index number 30  
N/A  
Index number 31  
N/A

Index number 32  
N/A  
Index number 33  
N/A  
Index number 34  
N/A  
Index number 35  
N/A  
Index number 36  
N/A  
Index number 37  
N/A  
Index number 38  
N/A  
Index number 39  
N/A

Index Selectivity at Age

0 1 0 0 0 0 0 0  
0 0 1 0 0 0 0 0  
0 0 0 1 0 0 0 0  
0 0 0 0 1 0 0 0  
0 0 0 0 0 1 1 1  
0 1 0 0 0 0 0 0  
0 0 1 0 0 0 0 0  
0 0 0 1 0 0 0 0  
0 0 0 0 1 0 0 0  
0 0 0 0 0 1 1 1  
0 0 1 0 0 0 0 0  
0 0 0 1 0 0 0 0  
0 0 0 0 1 0 0 0  
0 0 1 0 0 0 0 0  
0 0 0 1 0 0 0 0  
0 0 0 1 0 0 0 0  
0 0 0 0 1 0 0 0  
0 0 1 0 0 0 0 0  
0 0 0 1 0 0 0 0  
0 0 0 0 1 0 0 0  
0 0 1 0 0 0 0 0  
0 0 0 1 0 0 0 0  
0 0 0 0 1 0 0 0  
0 0 0 0 0 1 1 1  
0 0 0 1 0 0 0 0  
0 0 0 0 1 0 0 0  
0 1 0 0 0 0 0 0  
0 0 1 0 0 0 0 0  
0 1 0 0 0 0 0 0  
0 0 1 0 0 0 0 0  
0 0 0 1 0 0 0 0  
0 0 0 0 1 0 0 0  
1 0 0 0 0 0 0 0  
1 0 0 0 0 0 0 0  
1 0 0 0 0 0 0 0  
1 0 0 0 0 0 0 0  
1 0 0 0 0 0 0 0  
1 0 0 0 0 0 0 0  
1 0 0 0 0 0 0 0  
1 0 0 0 0 0 0 0

Deviations section: only applicable if associated lambda > 0

Nyear1 observed, expected, standardized residual

2	42223.2	26071.1	0.625936
3	22193.6	12144.6	0.782736
4	2871.67	3605.15	-0.295312
5	613.233	1037.69	-0.682885
6	278.133	298.335	-0.0910306
7	86.5266	85.767	0.0114464
8	34.2466	34.6052	-0.0135258

Fleet Obs, Initial, and Standardized Residual for Fmult

1	1.04658	1	0.0591107
---	---------	---	-----------

Standardized Residuals for Fmult\_devs by fleet and year

N/A

Index Obs, Initial, and Standardized Residual for q\_year1

N/A

Standardized Residuals for catchability deviations by index and year

index 1 q\_devs standardized residuals

2	0
3	0
4	0
5	0
6	0
7	0
8	0
9	0
10	0
11	0
12	0
13	0
14	0
15	0

index 2 q\_devs standardized residuals

2	0
3	0
4	0
5	0
6	0
7	0
8	0
9	0
10	0
11	0
12	0
13	0
14	0
15	0

index 3 q\_devs standardized residuals

2	0
3	0
4	0
5	0
6	0

```
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
  index 4 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
  index 5 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
  index 6 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
```

```
20 0
21 0
22 0
23 0
24 0
25 0
  index 7 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
20 0
21 0
22 0
23 0
24 0
25 0
  index 8 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
20 0
21 0
22 0
23 0
24 0
  index 9 q_devs standardized residuals
2 0
```

```
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
20 0
  index 10 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
  index 11 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
20 0
21 0
22 0
23 0
24 0
```



```
index 12 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
20 0
21 0
22 0
23 0
24 0
```

```
index 13 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
20 0
21 0
22 0
```

```
index 14 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
```

```
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
20 0
21 0
22 0
23 0
24 0
25 0
  index 15 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
20 0
21 0
22 0
23 0
24 0
25 0
  index 16 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
```

19 0  
20 0  
21 0  
22 0  
23 0  
24 0  
index 17 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
index 18 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
23 0  
index 19 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0

7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
23 0

index 20 q\_devs standardized residuals

2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0

index 21 q\_devs standardized residuals

2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0

19 0  
20 0  
21 0  
22 0  
index 22 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
index 23 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
index 24 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0

10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
index 25 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
23 0  
24 0  
25 0  
index 26 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0

20 0  
index 27 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
index 28 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
index 29 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
index 30 q\_devs standardized residuals  
2 0  
3 0

4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
index 31 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
index 32 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
index 33 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0



```
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
  index 34 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
20 0
21 0
22 0
23 0
24 0
25 0
  index 35 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
20 0
21 0
22 0
23 0
```

```
24 0
25 0
  index 36 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
  index 37 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
20 0
21 0
22 0
23 0
24 0
25 0
  index 38 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
```

12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0

index 39 q\_devs standardized residuals

2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0

Obs, Initial, and Standardized Residual for SRR steepness

N/A

Obs, Initial, and Standardized Residual for SRR unexpl S

N/A

End of Deviations Section

Selectivity by age and year for each fleet

fleet 1 selectivity at age

0.0413693	0.538843	0.96936	0.998834	0.999957	0.999998	1	1
0.0413693	0.538843	0.96936	0.998834	0.999957	0.999998	1	1
0.0413693	0.538843	0.96936	0.998834	0.999957	0.999998	1	1
0.0413693	0.538843	0.96936	0.998834	0.999957	0.999998	1	1
0.0413693	0.538843	0.96936	0.998834	0.999957	0.999998	1	1
0.0413693	0.538843	0.96936	0.998834	0.999957	0.999998	1	1
0.0413693	0.538843	0.96936	0.998834	0.999957	0.999998	1	1
0.0413693	0.538843	0.96936	0.998834	0.999957	0.999998	1	1
0.0413693	0.538843	0.96936	0.998834	0.999957	0.999998	1	1
0.0413693	0.538843	0.96936	0.998834	0.999957	0.999998	1	1
0.0413693	0.538843	0.96936	0.998834	0.999957	0.999998	1	1
0.0413693	0.538843	0.96936	0.998834	0.999957	0.999998	1	1
0.0139015	0.158404	0.71534	0.971058	0.997774	0.999834	0.999988	1
0.0139015	0.158404	0.71534	0.971058	0.997774	0.999834	0.999988	1
0.0139015	0.158404	0.71534	0.971058	0.997774	0.999834	0.999988	1
0.0139015	0.158404	0.71534	0.971058	0.997774	0.999834	0.999988	1
0.0139015	0.158404	0.71534	0.971058	0.997774	0.999834	0.999988	1
0.0139015	0.158404	0.71534	0.971058	0.997774	0.999834	0.999988	1
0.0139015	0.158404	0.71534	0.971058	0.997774	0.999834	0.999988	1
0.0139015	0.158404	0.71534	0.971058	0.997774	0.999834	0.999988	1
0.0139015	0.158404	0.71534	0.971058	0.997774	0.999834	0.999988	1

0.0139015 0.158404 0.71534 0.971058 0.997774 0.999834 0.999988 1  
0.0139015 0.158404 0.71534 0.971058 0.997774 0.999834 0.999988 1  
0.0139015 0.158404 0.71534 0.971058 0.997774 0.999834 0.999988 1  
0.0139015 0.158404 0.71534 0.971058 0.997774 0.999834 0.999988 1

Fmult by year for each fleet

1982 1.04658  
1983 1.47154  
1984 1.53676  
1985 1.49015  
1986 1.7454  
1987 1.39761  
1988 1.95195  
1989 1.67219  
1990 1.33065  
1991 1.61674  
1992 1.58005  
1993 1.4054  
1994 1.33018  
1995 1.61383  
1996 1.34096  
1997 0.878117  
1998 0.816099  
1999 0.678098  
2000 0.725304  
2001 0.565204  
2002 0.477099  
2003 0.453508  
2004 0.471593  
2005 0.490137  
2006 0.427629

Directed F by age and year for each fleet

fleet 1 directed F at age

0.0432965 0.563944 1.01452 1.04536 1.04654 1.04658 1.04658 1.04658  
0.0608767 0.792931 1.42646 1.46983 1.47148 1.47154 1.47154 1.47154  
0.0635745 0.82807 1.48967 1.53496 1.53669 1.53675 1.53676 1.53676  
0.0616465 0.802956 1.44449 1.48841 1.49009 1.49015 1.49015 1.49015  
0.072206 0.940497 1.69192 1.74337 1.74533 1.7454 1.7454 1.7454  
0.0578183 0.753094 1.35479 1.39598 1.39755 1.39761 1.39761 1.39761  
0.0807507 1.05179 1.89214 1.94967 1.95186 1.95194 1.95195 1.95195  
0.0691773 0.901047 1.62095 1.67024 1.67212 1.67219 1.67219 1.67219  
0.0550481 0.717011 1.28988 1.3291 1.33059 1.33065 1.33065 1.33065  
0.0668834 0.871169 1.5672 1.61486 1.61667 1.61674 1.61674 1.61674  
0.0653657 0.8514 1.53164 1.57821 1.57998 1.58005 1.58005 1.58005  
0.0581406 0.757292 1.36234 1.40377 1.40534 1.4054 1.4054 1.4054  
0.0550286 0.716758 1.28942 1.32863 1.33012 1.33018 1.33018 1.33018  
0.0224348 0.255638 1.15444 1.56713 1.61024 1.61357 1.61382 1.61383  
0.0186414 0.212414 0.959241 1.30215 1.33797 1.34074 1.34094 1.34096  
0.0122072 0.139098 0.628152 0.852702 0.876161 0.877971 0.878106 0.878117  
0.011345 0.129274 0.583788 0.79248 0.814282 0.815963 0.81609 0.816099  
0.00942661 0.107414 0.485071 0.658473 0.676589 0.677986 0.67809 0.678098  
0.0100828 0.114891 0.518839 0.704312 0.723689 0.725183 0.725295 0.725304  
0.00785721 0.0895309 0.404313 0.548846 0.563946 0.56511 0.565198 0.565204  
0.00663241 0.0755746 0.341288 0.463291 0.476037 0.47702 0.477093 0.477099  
0.00630446 0.0718377 0.324412 0.440383 0.452498 0.453433 0.453503 0.453508  
0.00655588 0.0747025 0.33735 0.457945 0.470543 0.471515 0.471588 0.471593



Freport unweighted in .std and MCMC files

year	unweighted	Nweighted	Bweighted
1982	1.03547	1.01873	1.02567
1983	1.45592	1.43838	1.44286
1984	1.52044	1.50115	1.50738
1985	1.47433	1.45024	1.4543
1986	1.72687	1.70867	1.71504
1987	1.38278	1.36125	1.36579
1988	1.93123	1.90025	1.905
1989	1.65444	1.6311	1.63477
1990	1.31652	1.30496	1.3096
1991	1.59958	1.57309	1.578
1992	1.56328	1.53773	1.54127
1993	1.39048	1.37055	1.37561
1994	1.31606	1.29667	1.30173
1995	1.44394	1.232	1.26369
1996	1.19979	1.00534	1.029
1997	0.785672	0.679438	0.690909
1998	0.730183	0.670307	0.691404
1999	0.606711	0.555429	0.577432
2000	0.648946	0.591884	0.616171
2001	0.505702	0.473633	0.488283
2002	0.426872	0.39157	0.40506
2003	0.405764	0.378845	0.392856
2004	0.421946	0.393166	0.408061
2005	0.438537	0.421346	0.434706
2006	0.38261	0.35137	0.367

Population Numbers at the Start of the Year

52426.1	42223.2	22193.6	2871.67	613.233	278.133	86.5266	34.2466
84903.3	41104.1	19668.6	6588.25	826.569	176.303	79.9592	34.7205
37256.6	65407.5	15228.6	3867.35	1240.43	155.369	33.1375	21.5548
49384.6	28624.3	23396	2810.91	682.226	218.443	27.3591	9.63081
60263.4	38015.4	10499.2	4518.03	519.491	125.873	40.3011	6.82435
43576.3	45902.5	12152	1583.09	647.077	74.2565	17.9911	6.73564
12206.7	33673	17697.5	2566.91	320.906	130.963	15.028	5.00417
24247	9218.73	9630.18	2184.28	299.103	37.3108	15.2254	2.32889
34627.2	18524.9	3065.44	1558.85	336.568	46.0013	5.73792	2.69962
27984.9	26831.9	7404.63	690.949	337.851	72.8358	9.95448	1.82584
28638	21429.8	9192.82	1264.78	112.529	54.9232	11.8398	1.91495
31979.1	21963.2	7488.6	1627.07	213.673	18.977	9.26168	2.31946
38179.3	24703.5	8432.36	1569.94	327.266	42.9099	3.81074	2.32559
41618.3	29584.9	9876.77	1901.52	340.415	70.856	9.28987	1.3285
29738.1	33318.3	18758.1	2549.11	324.824	55.6968	11.5546	1.73112
30139.2	23897.8	22058.4	5884.88	567.563	69.7773	11.9316	2.84552
32845.5	24376.5	17025.1	9636.33	2053.78	193.483	23.7442	5.02774
25339.7	26588.2	17537.6	7774.91	3571.77	744.831	70.0513	10.4157
31743.4	20551.7	19551.6	8839.9	3295.07	1486.57	309.566	33.4401
29816.6	25728.6	15000	9527.83	3578.57	1308.31	589.364	135.972
33598.1	24220.7	19260.8	8196.77	4505.82	1666.99	608.736	337.457
23921.2	27325.9	18386.8	11209.7	4222.59	2291.79	847.044	480.752
36073.6	19462	20821.8	10883.2	5908.55	2198.89	1192.32	690.745
17877.8	29341.6	14787.2	12166	5636.57	3021.81	1123.49	962.05
33806.1	14537.7	22228.3	8526.21	6188.53	2829.87	1515.59	1045.91

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2004 7.2334e-05  
2005 7.2334e-05  
2006 7.2334e-05  
index 31 q over time  
1990 4.51081e-05  
1991 4.51081e-05  
1992 4.51081e-05  
1993 4.51081e-05  
1995 4.51081e-05  
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2003 4.51081e-05  
2004 4.51081e-05  
2005 4.51081e-05  
2006 4.51081e-05  
index 32 q over time  
1992 8.9385e-05  
1993 8.9385e-05  
1994 8.9385e-05  
1995 8.9385e-05  
1996 8.9385e-05  
1997 8.9385e-05  
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2002 8.9385e-05  
2003 8.9385e-05  
2004 8.9385e-05  
2005 8.9385e-05  
2006 8.9385e-05

index 33 q over time

1985 1.82731e-06  
1986 1.82731e-06  
1987 1.82731e-06  
1988 1.82731e-06  
1990 1.82731e-06  
1991 1.82731e-06  
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2001 1.82731e-06  
2002 1.82731e-06  
2004 1.82731e-06  
2005 1.82731e-06  
2006 1.82731e-06

index 34 q over time

1982 2.87006e-05  
1983 2.87006e-05  
1984 2.87006e-05  
1985 2.87006e-05  
1986 2.87006e-05  
1987 2.87006e-05  
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2002 2.87006e-05  
2003 2.87006e-05  
2004 2.87006e-05  
2005 2.87006e-05  
2006 2.87006e-05

index 35 q over time

1982 0.000243063  
1983 0.000243063  
1984 0.000243063  
1985 0.000243063  
1986 0.000243063  
1987 0.000243063  
1988 0.000243063  
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2000	0.000243063
2001	0.000243063
2002	0.000243063
2003	0.000243063
2004	0.000243063
2005	0.000243063
2006	0.000243063
index 36 q over time	
1988	3.95539e-05
1989	3.95539e-05
1990	3.95539e-05
1991	3.95539e-05
1992	3.95539e-05
1993	3.95539e-05
1994	3.95539e-05
1995	3.95539e-05
1996	3.95539e-05
1997	3.95539e-05
1998	3.95539e-05
1999	3.95539e-05
2000	3.95539e-05
2001	3.95539e-05
2002	3.95539e-05
2003	3.95539e-05
2004	3.95539e-05
2005	3.95539e-05
2006	3.95539e-05
index 37 q over time	
1982	8.32894e-06
1983	8.32894e-06
1984	8.32894e-06
1985	8.32894e-06
1986	8.32894e-06
1987	8.32894e-06
1988	8.32894e-06
1989	8.32894e-06
1990	8.32894e-06
1991	8.32894e-06
1992	8.32894e-06
1993	8.32894e-06
1994	8.32894e-06
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1997	8.32894e-06
1998	8.32894e-06
1999	8.32894e-06
2000	8.32894e-06
2001	8.32894e-06
2002	8.32894e-06

2003 8.32894e-06  
 2004 8.32894e-06  
 2005 8.32894e-06  
 2006 8.32894e-06  
 index 38 q over time  
 1986 5.4817e-06  
 1987 5.4817e-06  
 1988 5.4817e-06  
 1989 5.4817e-06  
 1990 5.4817e-06  
 1991 5.4817e-06  
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 2002 5.4817e-06  
 2003 5.4817e-06  
 2004 5.4817e-06  
 2005 5.4817e-06  
 2006 5.4817e-06

index 39 q over time  
 1990 1.06021e-06  
 1992 1.06021e-06  
 1993 1.06021e-06  
 1994 1.06021e-06  
 1995 1.06021e-06  
 1996 1.06021e-06  
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 2002 1.06021e-06  
 2003 1.06021e-06  
 2004 1.06021e-06  
 2005 1.06021e-06  
 2006 1.06021e-06

Proportions of catch at age by fleet

fleet 1  
 Year 1 Obs = 0.146845 0.533716 0.27888 0.0256925 0.00901297 0.00318751  
 0.00184106 0.000824357  
 Year 1 Pred = 0.0592209 0.489379 0.383148 0.050457 0.010782 0.00489029  
 0.00152136 0.000602143  
 Year 2 Obs = 0.103612 0.598342 0.229546 0.0458839 0.0145793 0.00679528  
 0.000336608 0.000904635  
 Year 2 Pred = 0.102057 0.463542 0.310881 0.105598 0.0132553 0.00282735  
 0.00128229 0.000556808  
 Year 3 Obs = 0.0942382 0.521666 0.303281 0.0624068 0.0162689 0.00186435  
 7.84991e-05 0.000196248  
 Year 3 Pred = 0.0410321 0.666849 0.215747 0.0555328 0.0178208 0.00223216  
 0.000476081 0.000309674

Year 4 Obs = 0.0558107 0.392743 0.482878 0.0474579 0.0133215 0.00676819  
 0.000805737 0.000214863  
 Year 4 Pred = 0.0734577 0.397929 0.454732 0.0553941 0.0134514 0.00430712  
 0.000539449 0.000189894  
 Year 5 Obs = 0.0563748 0.497562 0.320918 0.109789 0.00917325 0.0040641  
 0.0016837 0.000435439  
 Year 5 Pred = 0.102635 0.57463 0.214828 0.0935601 0.0107625 0.0026078  
 0.000834946 0.000141385  
 Year 6 Obs = 0.0361216 0.546812 0.344315 0.0523557 0.0172825 0.000794231  
 0.000921308 0.00139785  
 Year 6 Pred = 0.0644045 0.646281 0.242203 0.0320152 0.0130931 0.00150255  
 0.000364043 0.000136293  
 Year 7 Obs = 0.0204602 0.529056 0.374768 0.0549979 0.016574 0.00311406  
 0.000488985 0.000540457  
 Year 7 Pred = 0.0229019 0.538329 0.373879 0.0548102 0.00685486 0.00279753  
 0.000321017 0.000106896  
 Year 8 Obs = 0.063287 0.315776 0.48164 0.111543 0.0232711 0.00362582  
 0.000593315 0.000263696  
 Year 8 Pred = 0.0942143 0.322615 0.460312 0.105718 0.0144832 0.0018067  
 0.00073726 0.000112772  
 Year 9 Obs = 0.131557 0.624327 0.155018 0.0705274 0.0156649 0.00212645  
 0.000567054 0.000212645  
 Year 9 Pred = 0.122267 0.631862 0.149391 0.0771245 0.0166611 0.00227725  
 0.00028405 0.000133642  
 Year 10 Obs = 0.0470108 0.570563 0.335697 0.0348471 0.0101911 0.00150284  
 0.000140891 4.69638e-05  
 Year 10 Pred = 0.0737896 0.644374 0.244576 0.0231181 0.0113094 0.00243818  
 0.000333227 6.11202e-05  
 Year 11 Obs = 0.0686058 0.561535 0.302207 0.0564193 0.00757272 0.00351053  
 0.000100301 5.01505e-05  
 Year 11 Pred = 0.0794587 0.545587 0.323407 0.0450847 0.00401318 0.00195879  
 0.000422258 6.8295e-05  
 Year 12 Obs = 0.0682494 0.596718 0.297482 0.0300616 0.0038772 0.00239006  
 0.00106225 0.000159337  
 Year 12 Pred = 0.0871078 0.568989 0.274343 0.0604773 0.00794637 0.000705756  
 0.000344443 8.62611e-05  
 Year 13 Obs = 0.0809769 0.51226 0.345857 0.0485466 0.0101345 0.00128535  
 0.00069211 0.000247182  
 Year 13 Pred = 0.0907913 0.567534 0.276807 0.0523202 0.0109126 0.00143085  
 0.000127071 7.75481e-05  
 Year 14 Obs = 0.0383395 0.377437 0.472962 0.0802409 0.0257108 0.00498672  
 0.000259051 6.47626e-05  
 Year 14 Pred = 0.0562998 0.40852 0.420033 0.0940353 0.0170324 0.00354833  
 0.00046525 6.65332e-05  
 Year 15 Obs = 0.00868307 0.371174 0.497293 0.0956745 0.0223509 0.00380554  
 0.000857587 0.000160798  
 Year 15 Pred = 0.0262955 0.306257 0.562529 0.09071 0.0117171 0.00201116  
 0.000417258 6.25143e-05  
 Year 16 Obs = 0.00206925 0.175541 0.554973 0.217202 0.0381432 0.011036  
 0.000758725 0.0002759  
 Year 16 Pred = 0.020685 0.175913 0.587926 0.193638 0.019004 0.00233947  
 0.000400078 9.54138e-05  
 Year 17 Obs = 0.00299222 0.148481 0.42423 0.348627 0.0651639 0.00917614  
 0.00126338 6.64938e-05  
 Year 17 Pred = 0.0211014 0.168677 0.432836 0.304215 0.0660169 0.00622781  
 0.000764353 0.00016185

Year 18 Obs = 0.0127178 0.153527 0.439854 0.282322 0.0815767 0.0251546  
 0.00386453 0.000983699  
 Year 18 Pred = 0.015123 0.172531 0.432152 0.241122 0.112938 0.0235858  
 0.00221848 0.00032986  
 Year 19 Obs = 0.00135811 0.0949441 0.49182 0.288289 0.0943885 0.0228409  
 0.00456818 0.00179023  
 Year 19 Pred = 0.017965 0.126056 0.450238 0.255008 0.0968687 0.0437648  
 0.00911462 0.000984591  
 Year 20 Obs = 0.000832829 0.218655 0.360388 0.282935 0.0978952 0.0274833  
 0.00931254 0.00249849  
 Year 20 Pred = 0.0167107 0.158 0.359582 0.290776 0.111479 0.0408196  
 0.0183904 0.0042429  
 Year 21 Obs = 0.0218685 0.0912526 0.435038 0.308651 0.104679 0.0256472  
 0.0108538 0.00200997  
 Year 21 Pred = 0.0166133 0.132027 0.418901 0.229068 0.128653 0.0476744  
 0.0174114 0.00965223  
 Year 22 Obs = 0.019559 0.119544 0.372829 0.30222 0.119242 0.0425162  
 0.0175955 0.00649449  
 Year 22 Pred = 0.0106871 0.1348 0.364041 0.285904 0.110063 0.0598345  
 0.0221175 0.0125532  
 Year 23 Obs = 0.00730276 0.0718673 0.386841 0.319956 0.130153 0.0524843  
 0.020748 0.010647  
 Year 23 Pred = 0.0152638 0.0908152 0.388194 0.260872 0.144712 0.0539427  
 0.0292534 0.0169475  
 Year 24 Obs = 0.0172803 0.13655 0.262167 0.285301 0.155593 0.0739879  
 0.0359712 0.03315  
 Year 24 Pred = 0.0078072 0.141127 0.282852 0.29861 0.14133 0.0758907  
 0.0282189 0.0241643  
 Year 25 Obs = 0.0148916 0.0835802 0.395291 0.255419 0.140028 0.067753  
 0.0290036 0.014034  
 Year 25 Pred = 0.0143006 0.0680254 0.420181 0.2082 0.15448 0.070758  
 0.0379004 0.0261555

Proportions of Discards at age by fleet

fleet 1  
 Year 1 Obs = 0 0 0 0 0 0 0 0  
 Year 1 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 2 Obs = 0 0 0 0 0 0 0 0  
 Year 2 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 3 Obs = 0 0 0 0 0 0 0 0  
 Year 3 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 4 Obs = 0 0 0 0 0 0 0 0  
 Year 4 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 5 Obs = 0 0 0 0 0 0 0 0  
 Year 5 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 6 Obs = 0 0 0 0 0 0 0 0  
 Year 6 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 7 Obs = 0 0 0 0 0 0 0 0  
 Year 7 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 8 Obs = 0 0 0 0 0 0 0 0  
 Year 8 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 9 Obs = 0 0 0 0 0 0 0 0  
 Year 9 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 10 Obs = 0 0 0 0 0 0 0 0  
 Year 10 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 11 Obs = 0 0 0 0 0 0 0 0  
 Year 11 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15

Year 12 Obs = 0 0 0 0 0 0 0 0  
Year 12 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 13 Obs = 0 0 0 0 0 0 0 0  
Year 13 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 14 Obs = 0 0 0 0 0 0 0 0  
Year 14 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 15 Obs = 0 0 0 0 0 0 0 0  
Year 15 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 16 Obs = 0 0 0 0 0 0 0 0  
Year 16 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 17 Obs = 0 0 0 0 0 0 0 0  
Year 17 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 18 Obs = 0 0 0 0 0 0 0 0  
Year 18 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 19 Obs = 0 0 0 0 0 0 0 0  
Year 19 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 20 Obs = 0 0 0 0 0 0 0 0  
Year 20 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 21 Obs = 0 0 0 0 0 0 0 0  
Year 21 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 22 Obs = 0 0 0 0 0 0 0 0  
Year 22 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 23 Obs = 0 0 0 0 0 0 0 0  
Year 23 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 24 Obs = 0 0 0 0 0 0 0 0  
Year 24 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 25 Obs = 0 0 0 0 0 0 0 0  
Year 25 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15

F Reference Points Using Final Year Selectivity and Freport options

refpt	F	slope	to plot on SRR			
F0.1	0.149933	0.314057				
Fmax	0.279354	0.506019				
F30%SPR	0.233529	0.436013				
F40%SPR	0.159166	0.327017				
Fmsy	0.279356	0.506023	SSBmsy	65713	MSY	16683.6
Fcurrent	0.38261	0.666407				

Stock-Recruitment Relationship Parameters

alpha = 33252.3  
beta = 0.0266636  
unexpl = 269287  
steepness = 1

Spawning Stock, Obs Recruits(year+1), Pred Recruits(year+1), standardized residual

Year	SSB	Obs Recruits	Pred Recruits	Standardized Residual
init	xxxx	52426.1	33252.2	0.963802
1982	23323.7	84903.3	33252.3	1.9844
1983	21896.3	37256.6	33252.3	0.240711
1984	19715.1	49384.6	33252.2	0.837283
1985	16626.9	60263.4	33252.2	1.25874
1986	15792.8	43576.3	33252.2	0.572402
1987	17258.9	12206.7	33252.2	-2.12146
1988	10160.4	24247	33252.2	-0.668587
1989	6341.52	34627.2	33252.2	0.0857779
1990	8811.5	27984.9	33252.2	-0.365078
1991	8781.53	28638	33252.2	-0.31624
1992	9619.62	31979.1	33252.2	-0.0826387



1993	10714.1	38179.3	33252.2	0.292504
1994	13549.5	41618.3	33252.2	0.47508
1995	18950.7	29738.1	33252.2	-0.236449
1996	20991.7	30139.2	33252.3	-0.208085
1997	21747.5	32845.5	33252.3	-0.0260564
1998	24144	25339.7	33252.3	-0.575281
1999	24936.4	31743.4	33252.3	-0.0983053
2000	27156.5	29816.6	33252.3	-0.230869
2001	31933.9	33598.1	33252.3	0.0219008
2002	36026	23921.2	33252.3	-0.697226
2003	39927.8	36073.6	33252.3	0.172402
2004	39008	17877.8	33252.3	-1.31369
2005	37606.1	33806.1	33252.3	0.03497
2006	38568.8	xxxx	33252.3	

Root Mean Square Error computed from Standardized Residuals

Component	#resids	RMSE
_Catch_Fleet_1	25	0.250838
Catch_Fleet_Total	25	0.250838
_Discard_Fleet_1	0	0
Discard_Fleet_Total	0	0
_Index_1	15	2.47422
_Index_2	15	1.54923
_Index_3	15	1.82645
_Index_4	15	2.29378
_Index_5	14	1.78194
_Index_6	25	1.85506
_Index_7	25	1.20796
_Index_8	24	1.8581
_Index_9	20	1.0392
_Index_10	15	1.1527
_Index_11	24	0.536144
_Index_12	24	0.960525
_Index_13	22	0.851905
_Index_14	25	1.57969
_Index_15	25	1.23703
_Index_16	24	0.959367
_Index_17	22	1.48635
_Index_18	23	1.25775
_Index_19	23	1.24994
_Index_20	22	1.42834
_Index_21	22	1.31644
_Index_22	22	0.893067
_Index_23	22	0.857093
_Index_24	22	1.5647
_Index_25	25	1.28614
_Index_26	20	1.57465
_Index_27	17	1.56556
_Index_28	17	1.45712
_Index_29	19	1.13238
_Index_30	19	1.59104
_Index_31	16	1.38172
_Index_32	15	1.46736
_Index_33	19	1.65396
_Index_34	25	1.00526
_Index_35	25	1.03288
_Index_36	19	1.08328

_Index_37	25	1.30295
_Index_38	21	1.57414
_Index_39	15	1.39922
Index_Total	802	1.39533
Nyear1	7	0.473077
Fmult_Year1	1	0.0591107
_Fmult_devs_Fleet_1	0	0
Fmult_devs_Total	0	0
Recruit_devs	0	0
Fleet_Sel_params	4	1.64315
Index_Sel_params	0	0
q_year1	0	0
q_devs	0	0
SRR_steepness	0	0
SRR_unexpl_S	0	0

Projections not requested

that's all

**SS2 BASE RUN (F08 BASE T2.REP)**

Code\_version: \_\_2.00o;\_01/31/08;\_Stock\_Synthesis\_2\_by\_Richard\_Methot\_(NOAA);\_  
using\_Otter\_Research\_ADMB\_7.0.1

Time: Fri Mar 07 09:59:38 2008

Data\_File: F08\_BASE\_T2.DAT  
Control\_File: F08\_BASE\_T2.CTL

Convergence\_Level:  
Hessian:  
Sum\_of\_months\_on\_read\_was:\_ 12 rescaled\_to\_sum\_to: 1

LIKELIHOOD 1049.61  
indices 980.127  
discard 0  
length\_comps 0  
age\_comps 62.5156  
size-at-age 0  
mean\_body\_wt 0  
Equil\_catch 0  
catch 6.96389  
Recruitment 0  
Parm\_priors 0  
Parm\_devs 0  
penalties 0  
Forecast\_Recruitment 0

	Fleet	surv_lambda	surv_like	disc_lambda	disc_like	length_lambda	length_like	age_lambda	age_like	sizeage_lambda	sizeage_like
1	0	0	0	0	0	0	0	1	62.5156	0	0
2	1	45.0328	0	0	0	0	0	0	0	0	0
3	1	12.5742	0	0	0	0	0	0	0	0	0
4	1	28.7336	0	0	0	0	0	0	0	0	0
5	1	38.7276	0	0	0	0	0	0	0	0	0
6	1	20.2474	0	0	0	0	0	0	0	0	0
7	1	37.3957	0	0	0	0	0	0	0	0	0
8	1	20.22	0	0	0	0	0	0	0	0	0
9	1	45.0815	0	0	0	0	0	0	0	0	0
10	1	13.0915	0	0	0	0	0	0	0	0	0
11	1	6.40653	0	0	0	0	0	0	0	0	0
12	1	24.0979	0	0	0	0	0	0	0	0	0
13	1	9.3846	0	0	0	0	0	0	0	0	0
14	1	26.7067	0	0	0	0	0	0	0	0	0
15	1	16.351	0	0	0	0	0	0	0	0	0
16	1	60.9862	0	0	0	0	0	0	0	0	0
17	1	41.6652	0	0	0	0	0	0	0	0	0
18	1	137.576	0	0	0	0	0	0	0	0	0
19	1	44.8097	0	0	0	0	0	0	0	0	0
20	1	17.8631	0	0	0	0	0	0	0	0	0
21	1	17.8111	0	0	0	0	0	0	0	0	0
22	1	18.2993	0	0	0	0	0	0	0	0	0
23	1	14.9983	0	0	0	0	0	0	0	0	0
24	1	8.38893	0	0	0	0	0	0	0	0	0
25	1	6.84621	0	0	0	0	0	0	0	0	0

```

26 1 21.3152 0 0 0 0 0 0 0 0
27 1 17.3603 0 0 0 0 0 0 0 0
28 1 20.9734 0 0 0 0 0 0 0 0
29 1 19.1558 0 0 0 0 0 0 0 0
30 1 18.1813 0 0 0 0 0 0 0 0
31 1 11.2386 0 0 0 0 0 0 0 0
32 1 24.9327 0 0 0 0 0 0 0 0
33 1 14.454 0 0 0 0 0 0 0 0
34 1 12.8309 0 0 0 0 0 0 0 0
35 1 23.0387 0 0 0 0 0 0 0 0
36 1 10.8479 0 0 0 0 0 0 0 0
37 1 9.90421 0 0 0 0 0 0 0 0
38 1 12.9866 0 0 0 0 0 0 0 0
39 1 22.3021 0 0 0 0 0 0 0 0
40 1 27.3099 0 0 0 0 0 0 0 0

```

```

Source Lambda Like
mean_body_wt 0 0
Equil_catch 0 0
Catch 10 0.696389
Recruitment 0 0
Parm_priors 0 0
Parm_devs 1 0
penalties 0

```

```

Variance_adjustments_to_input_values 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40
Index_extra_CV 0 0.14 0.14 0.14 0.14 0.14 0.14 0.19 0.19 0.19 0.19 0.19 0.2 0.2
0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2
0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2
Discard_extra_CV 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
MeanBodyWt_extra_CV 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
effN_mult_Lencomp 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
effN_mult_Agecomp 1.863 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
effN_mult_Len-at-age 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

```

PARAMETERS

```

Num Value Phase Min Max Init Prior PR_type SD Active_Cnt Prior_Like Bound
M-G_parmsUsing_offset_approach_#:_3
Gender:_1_Pattern:_1
1 0.2 -3
2 0 -3
3 28.1 -2
4 60.2 -2
5 0.2052 -3
6 0.1 -2
7 0 -3
biology_parms
8 2.44e-006 -3
9 3.34694 -3
10 28.1 -3

```

```

11 -0.25 -3
12 1 -3
13 0 -3
recrdist_by_growthpattern:1
14 0 -3
recrdist_by_area:1
15 0 -3
recrdist_by_seas:1
16 4 -3
cohort_growth_dev:2
17 1 -3
MGparm_env_linkages
MG_parm_blockparms
M-G_parm_devs 1
1_YR1982 0 -

MGParm_Block_Assignments
SR_parms
1 10.7176 1 3 31 10.1121 0 -1 99 1 0
2 0.939164 1 0.2 1 0.8 0 -1 99 2 0
3 0.6 -1
4 0 -1
5 0.0676784 1 -5 5 0 0 -1 99 3 0
6 0 -1
Recr_Devs
1982 0.649771 - - - - - 4
1983 0.696608 - - - - - 5
1984 0.205706 - - - - - 6
1985 0.470484 - - - - - 7
1986 0.549011 - - - - - 8
1987 0.239684 - - - - - 9
1988 -1.08107 - - - - - 10
1989 -0.0240164 - - - - - 11
1990 0.306391 - - - - - 12
1991 -0.0233986 - - - - - 13
1992 0.1834 - - - - - 14
1993 0.212817 - - - - - 15
1994 0.129323 - - - - - 16
1995 0.130302 - - - - - 17
1996 -0.239727 - - - - - 18
1997 -0.17978 - - - - - 19
1998 -0.094609 - - - - - 20
1999 -0.334627 - - - - - 21
2000 -0.131961 - - - - - 22
2001 -0.177638 - - - - - 23
2002 -0.169975 - - - - - 24
2003 -0.467014 - - - - - 25
2004 -0.0922965 - - - - - 26
2005 -0.725908 - - - - - 27
2006 -0.0314726 - - - - - 28
init_F_parms
1 1.31198 1 0 2 1 1 -1 10 29 0
Q_parms
sel_parms
#_size_sel:_1
#_male
#_size_sel:_2

```

#\_male  
#\_size\_sel:\_3  
#\_male  
#\_size\_sel:\_4  
#\_male  
#\_size\_sel:\_5  
#\_male  
#\_size\_sel:\_6  
#\_male  
#\_size\_sel:\_7  
#\_male  
#\_size\_sel:\_8  
#\_male  
#\_size\_sel:\_9  
#\_male  
#\_size\_sel:\_10  
#\_male  
#\_size\_sel:\_11  
#\_male  
#\_size\_sel:\_12  
#\_male  
#\_size\_sel:\_13  
#\_male  
#\_size\_sel:\_14  
#\_male  
#\_size\_sel:\_15  
#\_male  
#\_size\_sel:\_16  
#\_male  
#\_size\_sel:\_17  
#\_male  
#\_size\_sel:\_18  
#\_male  
#\_size\_sel:\_19  
#\_male  
#\_size\_sel:\_20  
#\_male  
#\_size\_sel:\_21  
#\_male  
#\_size\_sel:\_22  
#\_male  
#\_size\_sel:\_23  
#\_male  
#\_size\_sel:\_24  
#\_male  
#\_size\_sel:\_25  
#\_male  
#\_size\_sel:\_26  
#\_male  
#\_size\_sel:\_27  
#\_male  
#\_size\_sel:\_28  
#\_male  
#\_size\_sel:\_29  
#\_male  
#\_size\_sel:\_30  
#\_male

```

#_size_sel:_31
#_male
#_size_sel:_32
#_male
#_size_sel:_33
#_male
#_size_sel:_34
#_male
#_size_sel:_35
#_male
#_size_sel:_36
#_male
#_size_sel:_37
#_male
#_size_sel:_38
#_male
#_size_sel:_39
#_male
#_size_sel:_40
#_male
#_age_sel:_1
1 1.82586 2 0.5 9 4 4 -1 99 30 0
2 -3 -3
3 0.0263013 3 0 9 2 2 -1 99 31 0 LO
4 9 -3
5 -999 -2
6 -999 -2
#_male
#_age_sel:_2
7 1 -3
8 1 -3
#_male
#_age_sel:_3
9 2 -3
10 2 -3
#_male
#_age_sel:_4
11 3 -3
12 3 -3
#_male
#_age_sel:_5
13 4 -3
14 4 -3
#_male
#_age_sel:_6
15 5 -3
16 15 -3
#_male
#_age_sel:_7
17 1 -3
18 1 -3
#_male
#_age_sel:_8
19 2 -3
20 2 -3
#_male
#_age_sel:_9

```

21 3 -3  
22 3 -3  
#\_male  
#\_age\_sel:\_10  
23 4 -3  
24 4 -3  
#\_male  
#\_age\_sel:\_11  
25 5 -3  
26 15 -3  
#\_male  
#\_age\_sel:\_12  
27 0 -3  
28 0 -3  
#\_male  
#\_age\_sel:\_13  
29 2 -3  
30 2 -3  
#\_male  
#\_age\_sel:\_14  
31 3 -3  
32 3 -3  
#\_male  
#\_age\_sel:\_15  
33 4 -3  
34 4 -3  
#\_male  
#\_age\_sel:\_16  
35 2 -3  
36 2 -3  
#\_male  
#\_age\_sel:\_17  
37 3 -3  
38 3 -3  
#\_male  
#\_age\_sel:\_18  
39 3 -3  
40 3 -3  
#\_male  
#\_age\_sel:\_19  
41 4 -3  
42 4 -3  
#\_male  
#\_age\_sel:\_20  
43 2 -3  
44 2 -3  
#\_male  
#\_age\_sel:\_21  
45 3 -3  
46 3 -3  
#\_male  
#\_age\_sel:\_22  
47 4 -3  
48 4 -3  
#\_male  
#\_age\_sel:\_23  
49 2 -3



50 2 -3  
#\_male  
#\_age\_sel:\_24  
51 3 -3  
52 3 -3  
#\_male  
#\_age\_sel:\_25  
53 4 -3  
54 4 -3  
#\_male  
#\_age\_sel:\_26  
55 5 -3  
56 15 -3  
#\_male  
#\_age\_sel:\_27  
57 3 -3  
58 3 -3  
#\_male  
#\_age\_sel:\_28  
59 4 -3  
60 4 -3  
#\_male  
#\_age\_sel:\_29  
61 1 -3  
62 1 -3  
#\_male  
#\_age\_sel:\_30  
63 2 -3  
64 15 -3  
#\_male  
#\_age\_sel:\_31  
65 1 -3  
66 1 -3  
#\_male  
#\_age\_sel:\_32  
67 2 -3  
68 2 -3  
#\_male  
#\_age\_sel:\_33  
69 3 -3  
70 3 -3  
#\_male  
#\_age\_sel:\_34  
71 4 -3  
72 15 -3  
#\_male  
#\_age\_sel:\_35  
73 0 -3  
74 0 -3  
#\_male  
#\_age\_sel:\_36  
75 0 -3  
76 0 -3  
#\_male  
#\_age\_sel:\_37  
77 0 -3  
78 0 -3

```

#_male
#_age_sel:_38
79 0 -3
80 0 -3
#_male
#_age_sel:_39
81 0 -3
82 0 -3
#_male
#_age_sel:_40
83 4 -3
84 15 -3
#_male
sel_parm_env_linkages
sel_parm_blockparms
85 2.81625 2 0.5 9 4 4 -1 99 32 0
86 -3 -3
87 0.538898 3 0 9 2 2 -1 99 33 0
88 9 -3
SEL_parm_devs
1_YR1982 0
Forecast_Recr_Devs
2007 0 - - - - - 34

```

Selex\_Block\_Assignments\_Years:

Base_parm#	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006		
1	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0

RECR\_DIST

G\_pattern gender Seas Area Value Used?  
1 1 1 1 1 1

MOVEMENT

Seas Source Dist 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

SUBMORPHDIST 1

MGparm\_By\_Year\_after\_adjustments

Year	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1982	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0
1983	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0
1984	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0
1985	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0
1986	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0
1987	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0
1988	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0
1989	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0
1990	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0
1991	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0
1992	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0
1993	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0
1994	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0
1995	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0

1996	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0	0	4	1
1997	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0	0	4	1
1998	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0	0	4	1
1999	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0	0	4	1
2000	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0	0	4	1
2001	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0	0	4	1
2002	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0	0	4	1
2003	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0	0	4	1
2004	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0	0	4	1
2005	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0	0	4	1
2006	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0	0	4	1

SELParm(Size)\_By\_Year\_after\_adjustments  
Fleet/Svy Year

SELParm(Age)\_By\_Year\_after\_adjustments  
Fleet/Svy Year

1	1982	1.82586	-3	0.0263013	9	-999	-999
1	1995	2.81625	-3	0.538898	9	-999	-999
2	1982	1	1				
3	1982	2	2				
4	1982	3	3				
5	1982	4	4				
6	1982	5	15				
7	1982	1	1				
8	1982	2	2				
9	1982	3	3				
10	1982	4	4				
11	1982	5	15				
12	1982	0	0				
13	1982	2	2				
14	1982	3	3				
15	1982	4	4				
16	1982	2	2				
17	1982	3	3				
18	1982	3	3				
19	1982	4	4				
20	1982	2	2				
21	1982	3	3				
22	1982	4	4				
23	1982	2	2				
24	1982	3	3				
25	1982	4	4				
26	1982	5	15				
27	1982	3	3				
28	1982	4	4				
29	1982	1	1				
30	1982	2	15				
31	1982	1	1				
32	1982	2	2				
33	1982	3	3				
34	1982	4	15				
35	1982	0	0				
36	1982	0	0				
37	1982	0	0				
38	1982	0	0				
39	1982	0	0				

40 1982 4 15

```
EXPLOITATION   Hrate_is_Continuous_F   Fleet_in_columns;_year_in_rows
yr seas 1
init_yr 1 1.31198
1982 1 1.13836
1983 1 1.55817
1984 1 1.54648
1985 1 1.43054
1986 1 1.66612
1987 1 1.34542
1988 1 1.84378
1989 1 1.53288
1990 1 1.33127
1991 1 1.4755
1992 1 1.58689
1993 1 1.39564
1994 1 1.31609
1995 1 1.65754
1996 1 1.34458
1997 1 0.882212
1998 1 0.825846
1999 1 0.648569
2000 1 0.732475
2001 1 0.60453
2002 1 0.504336
2003 1 0.511568
2004 1 0.534382
2005 1 0.490766
2006 1 0.430377
2007 1 -0.0753161
```

```
TIME_SERIES   Bio-Smry_age:_1   Hrate_is_Continuous_F
pop year period season bio-all bio-smry SpawnBio recruit-0   enc_catch:_1
dead_catch:_1   ret_catch:_1   obs_cat:_1   Hrate-1   SPB_vir_LH
1 1980 VIRG 1 361392 361084 359812 45141.5 0 0 0 0 0 359835
1 1981 INIT 1 26232 25902.8 24825.9 48302.3 20518.6 20518.6 20518.6 10000
1.31198 24825.9
1 1982 TIME 1 26306.7 25902.8 24825.9 59260.4 18893.4 18893.4 18893.4 18963
1.13836 24854.3
1 1983 TIME 1 30829.6 30394.5 28937.2 63849.3 26441 26441 26441 26466 1.55817
29102.6
1 1984 TIME 1 29872.1 29607.2 28076.1 38877.9 25307.8 25307.8 25307.8 26057
1.54648 28176.8
1 1985 TIME 1 24561.8 24228.7 23199.9 48873.9 20587.2 20587.2 20587.2 20432
1.43054 23326.4
1 1986 TIME 1 23610.6 23254 22093 52333.3 20866.3 20866.3 20866.3 20866
1.66612 22228.5
1 1987 TIME 1 23209 22948.2 21708 38266.1 18103.6 18103.6 18103.6 18312
1.34542 21807.1
1 1988 TIME 1 22768.5 22698.9 21697.8 10213.5 21465.3 21465.3 21465.3 21761
1.84378 21724.3
1 1989 TIME 1 11125.5 10961.7 10636.5 24033.7 9958.29 9958.29 9958.29 10314
1.53288 10698.7
1 1990 TIME 1 9914.97 9699.42 9166.09 31629 7541.43 7541.43 7541.43 7976
1.33127 9247.99
```

1 1991 TIME 1 13576.3 13402.5 12648.1 25499.1 11132.6 11132.6 11132.6 11316  
1.4755 12714.1  
1 1992 TIME 1 13699.6 13484.9 12839.5 31507 12014.5 12014.5 12014.5 11805  
1.58689 12921.1  
1 1993 TIME 1 13873.5 13651.9 12913 32505.9 11055 11055 11055 10781 1.39564  
12997.1  
1 1994 TIME 1 15741.9 15529.9 14733.8 31111.1 12255.9 12255.9 12255.9 12182  
1.31609 14814.4  
1 1995 TIME 1 16677.8 16461.9 15682.9 31691.4 9961.4 9961.4 9961.4 10495  
1.65754 15764.9  
1 1996 TIME 1 20798.4 20640.3 19763 23202.9 11615.2 11615.2 11615.2 11643  
1.34458 19823.1  
1 1997 TIME 1 22566.4 22395 21679.7 25149.1 10675.6 10675.6 10675.6 10325  
0.882212 21744.8  
1 1998 TIME 1 25380 25188.7 24474.2 28072.7 11880.4 11880.4 11880.4 11641  
0.825846 24546.9  
1 1999 TIME 1 27843.3 27690.2 26895.3 22476.6 10792.5 10792.5 10792.5 10851  
0.648569 26953.5  
1 2000 TIME 1 30862.4 30671.3 29970.9 28045.7 13926.2 13926.2 13926.2 13756  
0.732475 30043.5  
1 2001 TIME 1 31673 31489.7 30711.7 26900.5 12108.4 12108.4 12108.4 11932  
0.60453 30781.3  
1 2002 TIME 1 34515.3 34328 33529.4 27480.8 11553.9 11553.9 11553.9 11308  
0.504336 33600.6  
1 2003 TIME 1 38468.2 38326.8 37520.3 20750 13359.7 13359.7 13359.7 12927  
0.511568 37574.1  
1 2004 TIME 1 39429.8 39223.3 38559.6 30293.8 14728.8 14728.8 14728.8 14306  
0.534382 38638  
1 2005 TIME 1 40151.2 40041.4 39221.1 16112.3 13511.3 13511.3 13511.3 13446  
0.490766 39262.9  
1 2006 TIME 1 39624.5 39404.9 38820.4 32222.4 12585.5 12585.5 12585.5 12574  
0.430377 38903.9  
1 2007 FORE 1 42413.6 42140.1 41414.3 40143.5 -2798.3 -2798.3 -2798.3 -2798.3  
-0.0753161 41414.3

SPR\_series uses\_R0= 45141.5 ###note\_Y/R\_unit\_is\_Dead\_Biomass  
Year Bio\_all Bio\_Smry SPBzero SPBfished SPBfished/R SPR Y/R GenTime Actual:  
Bio\_all Bio\_Smry Enc\_Catch Dead\_Catch Retain\_Catch SPB Recruits Tot\_Exploit  
More\_F(by\_morph): aveF-1 maxF-1  
1982 27478.1 27170.5 359812 26139.4 0.579056 0.0726475 0.439307 0.267242 +  
26306.7 25902.8 18893.4 18893.4 18893.4 24825.9 59260.4 0.718197 + 1.09592  
1.13834  
1983 21500.3 21192.7 359812 20218.2 0.447886 0.0561911 0.407957 0.176843 +  
30829.6 30394.5 26441 26441 26441 28937.2 63849.3 0.857647 + 1.50008  
1.55815  
1984 21620.7 21313.1 359812 20337.2 0.450521 0.0565217 0.408674 0.178888 +  
29872.1 29607.2 25307.8 25307.8 25307.8 28076.1 38877.9 0.847203 + 1.48883  
1.54646  
1985 22927.2 22619.5 359812 21628.9 0.479136 0.0601117 0.416208 0.200496 +  
24561.8 24228.7 20587.2 20587.2 20587.2 23199.9 48873.9 0.838182 + 1.37721  
1.43052  
1986 20471 20163.3 359812 19201.9 0.425372 0.0533666 0.401664 0.159029 +  
23610.6 23254 20866.3 20866.3 20866.3 22093 52333.3 0.883768 + 1.60401  
1.6661  
1987 24037.5 23729.8 359812 22727.9 0.503482 0.0631662 0.422274 0.218003 +  
23209 22948.2 18103.6 18103.6 18103.6 21708 38266.1 0.780027 + 1.29526  
1.3454

1988 19047.5 18739.8 359812 17798.8 0.394289 0.0494668 0.392454 0.133534 +  
 22768.5 22698.9 21465.3 21465.3 21465.3 21697.8 10213.5 0.942762 + 1.77504  
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 1989 21763.3 21455.7 359812 20478.1 0.453642 0.0569133 0.409518 0.181297 +  
 11125.5 10961.7 9958.29 9958.29 9958.29 10636.5 24033.7 0.895087 + 1.47573  
 1.53286  
 1990 24236.6 23929 359812 22925.1 0.507851 0.0637142 0.42333 0.221058 +  
 9914.97 9699.42 7541.43 7541.43 7541.43 9166.09 31629 0.76061 + 1.28164  
 1.33125  
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 13576.3 13402.5 11132.6 11132.6 11132.6 12648.1 25499.1 0.820001 + 1.42049  
 1.47547  
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 13699.6 13484.9 12014.5 12014.5 12014.5 12839.5 31507 0.876998 + 1.52773  
 1.58687  
 1993 23365.1 23057.5 359812 22062.3 0.488736 0.0613161 0.418636 0.207496 +  
 13873.5 13651.9 11055 11055 11055 12913 32505.9 0.796848 + 1.34361 1.39562  
 1994 24455.2 24147.6 359812 23141.7 0.512649 0.0643161 0.42448 0.224383 +  
 15741.9 15529.9 12255.9 12255.9 12255.9 14733.8 31111.1 0.778554 + 1.26703  
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 1.65753  
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 1.34456  
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 22566.4 22395 10675.6 10675.6 10675.6 21679.7 25149.1 0.473074 + 0.809652  
 0.882203  
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 0.825837  
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 30862.4 30671.3 13926.2 13926.2 13926.2 29970.9 28045.7 0.451235 + 0.67223  
 0.732467  
 2001 64921.6 64614 359812 63404.8 1.40458 0.176216 0.569624 0.45108 + 31673  
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 0.604523  
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 34515.3 34328 11553.9 11553.9 11553.9 33529.4 27480.8 0.334747 + 0.462856  
 0.504331  
 2003 73497.5 73189.9 359812 71974.8 1.59443 0.200035 0.576554 0.494384 +  
 38468.2 38326.8 13359.7 13359.7 13359.7 37520.3 20750 0.347291 + 0.469493  
 0.511563  
 2004 71140 70832.3 359812 69618.7 1.54223 0.193486 0.575052 0.483386 +  
 39429.8 39223.3 14728.8 14728.8 14728.8 38559.6 30293.8 0.373545 + 0.49043  
 0.534376  
 2005 75819 75511.4 359812 74295 1.64583 0.206483 0.57776 0.504629 + 40151.2  
 40041.4 13511.3 13511.3 13511.3 39221.1 16112.3 0.336511 + 0.450401  
 0.490761  
 2006 83672.4 83364.7 359812 82144.5 1.81971 0.228298 0.580004 0.535592 +  
 39624.5 39404.9 12585.5 12585.5 12585.5 38820.4 32222.4 0.317618 + 0.39498  
 0.430373

2007 361368 361061 359812 359812 7.97076 1 0 0.818731 + 42413.6 42140.1 -  
2798.3 -2798.3 -2798.3 41414.3 40143.5 -0.0659764 + 0 0

SPAWN\_RECRUIT Function: 3 - - - - -

10.7176 Ln(R0) 45141.5

0.939164 steep

0.6 stddev\_recr

0 env\_link\_

0.0676784 init-eq 48302.3

1982 2006 recdev:start\_end 1957 first\_year\_with\_full\_bias\_adjustment

year spawn\_bio exp\_recr with-env bias-adj pred\_recr dev

S/Rcurve 359812 45141.5

Virg 359812 45141.5 45141.5 37705.3 45141.5

Init 24825.9 48302.3 48302.3 40345.5 48302.3

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1983 28937.2 38088.7 38088.7 31814.4 63849.3 0.696608

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1985 23199.9 36552.9 36552.9 30531.5 48873.9 0.470484

1986 22093 36184.2 36184.2 30223.6 52333.3 0.549011

1987 21708 36049 36049 30110.7 38266.1 0.239684

1988 21697.8 36045.4 36045.4 30107.7 10213.5 -1.08107

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1991 12648.1 31250.7 31250.7 26102.8 25499.1 -0.0233986

1992 12839.5 31400 31400 26227.5 31507 0.1834

1993 12913 31456.5 31456.5 26274.7 32505.9 0.212817

1994 14733.8 32728.3 32728.3 27337 31111.1 0.129323

1995 15682.9 33306.2 33306.2 27819.7 31691.4 0.130302

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2003 37520.3 39628.9 39628.9 33100.9 20750 -0.467014

2004 38559.6 39775.1 39775.1 33222.9 30293.8 -0.0922965

2005 39221.1 39864.6 39864.6 33297.7 16112.3 -0.725908

2006 38820.4 39810.7 39810.7 33252.7 32222.4 -0.0314726

2007 41414.3 40143.5 40143.5 40143.5 40143.5 0 forecast

N\_est r.m.s.e.

25 0.397466

INDEX\_2

index year vuln\_bio obs exp eff\_Q SE Dev Like Like+log(s)

2 1982 37579.7 -0.001 6.32077 0.000168196 0.16

2 1983 46417.5 -0.001 7.80725 0.000168196 0.16

2 1984 49202.1 -0.001 8.27562 0.000168196 0.16

2 1985 29972.9 -0.001 5.04132 0.000168196 0.16

2 1986 37849.5 -0.001 6.36615 0.000168196 0.16

2 1987 40159 -0.001 6.7546 0.000168196 0.16

2 1988 29732.7 -0.001 5.00094 0.000168196 0.16

2 1989 7783.54 -0.001 1.30916 0.000168196 0.16

2 1990 18538.6 -0.001 3.11812 0.000168196 0.16

2 1991 24589.3 -0.001 4.13582 0.000168196 0.16

2 1992 19712.8 7.15 3.31563 0.000168196 0.3 0.768465 3.28077 2.0768

2 1993 24252.1 6.5 4.07911 0.000168196 0.3 0.465923 1.20602 0.00204876  
 2 1994 25207.8 3.76 4.23986 0.000168196 0.3 -0.120112 0.0801492 -1.12382  
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 2 1996 25529.3 22.17 4.29394 0.000168196 0.3 1.64154 14.9702 13.7662  
 2 1997 18748.7 3.86 3.15345 0.000168196 0.3 0.202169 0.227068 -0.976904  
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 2 1999 22799 2.11 3.8347 0.000168196 0.3 -0.597405 1.98273 0.778762  
 2 2000 18285.9 0.7 3.07562 0.000168196 0.3 -1.48018 12.1719 10.9679  
 2 2001 22797.9 3.07 3.83452 0.000168196 0.3 -0.222366 0.274704 -0.929269  
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 3 1983 17125.8 -0.001 8.02186 0.000468409 0.16  
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 3 1988 16451.2 -0.001 7.7059 0.000468409 0.16  
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 3 1991 7649.87 -0.001 3.58327 0.000468409 0.16  
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 3 1993 7131.67 6.7 3.34054 0.000468409 0.3 0.695975 2.69101 1.48703  
 3 1994 9681.42 7.2 4.53486 0.000468409 0.3 0.462286 1.18727 -0.0167046  
 3 1995 10483.5 4.59 4.91056 0.000468409 0.3 -0.0675087 0.025319 -1.17865  
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 3 1997 17177.1 4.8 8.04592 0.000468409 0.3 -0.51655 1.48235 0.27838  
 3 1998 13495.5 3.25 6.32142 0.000468409 0.3 -0.665289 2.45894 1.25497  
 3 1999 14815.2 4.8 6.93956 0.000468409 0.3 -0.368622 0.754901 -0.449071  
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 3 2002 17089 10.74 8.00462 0.000468409 0.3 0.293956 0.480056 -0.723917  
 3 2003 16653.5 14.36 7.80064 0.000468409 0.3 0.610241 2.06886 0.864884  
 3 2004 17011.4 8.68 7.96831 0.000468409 0.3 0.0855489 0.040659 -1.16331  
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 4 1983 4114.39 -0.001 1.55922 0.000378967 0.16  
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 4 1990 1669.65 -0.001 0.632744 0.000378967 0.16  
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 4 1992 1435.19 0.33 0.543889 0.000378967 0.3 -0.499653 1.38696 0.18299  
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 4 1994 1449.03 0.82 0.549135 0.000378967 0.3 0.40096 0.893162 -0.310811  
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 4 1996 2789.92 0.6 1.05729 0.000378967 0.3 -0.566533 1.78311 0.579139  
 4 1997 5118.47 1.04 1.93973 0.000378967 0.3 -0.623329 2.15855 0.954581  
 4 1998 7732.66 2.29 2.93042 0.000378967 0.3 -0.246596 0.33783 -0.866143  
 4 1999 6311.96 2.9 2.39203 0.000378967 0.3 0.192569 0.206017 -0.997956



4	2000	7814.12	4.96	2.96129	0.000378967	0.3	0.515779	1.47793	0.273962
4	2001	8460.83	6.42	3.20638	0.000378967	0.3	0.694276	2.67789	1.47392
4	2002	7310.84	5.58	2.77057	0.000378967	0.3	0.700136	2.72328	1.51931
4	2003	9939.34	8.48	3.76668	0.000378967	0.3	0.811515	3.65865	2.45468
4	2004	9638.67	4.56	3.65274	0.000378967	0.3	0.221845	0.273417	-0.930556
4	2005	9694.74	3.07	3.67399	0.000378967	0.3	-0.1796	0.179201	-1.02477
4	2006	7514.34	4.29	2.84769	0.000378967	0.3	0.40978	0.932885	-0.271088
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5	1983	907.354	-0.001	0.363616	0.000400743	0.16			
5	1984	709.173	-0.001	0.284196	0.000400743	0.16			
5	1985	515.91	-0.001	0.206748	0.000400743	0.16			
5	1986	583.297	-0.001	0.233752	0.000400743	0.16			
5	1987	551.79	-0.001	0.221126	0.000400743	0.16			
5	1988	388.637	-0.001	0.155743	0.000400743	0.16			
5	1989	363.804	-0.001	0.145792	0.000400743	0.16			
5	1990	377.718	-0.001	0.151368	0.000400743	0.16			
5	1991	361.088	-0.001	0.144704	0.000400743	0.16			
5	1992	117.448	0.04	0.0470665	0.000400743	0.3	-0.162682	0.14703	-1.05694
5	1993	240.372	0.05	0.0963272	0.000400743	0.3	-0.655728	2.38877	1.1848
5	1994	320.674	0.26	0.128508	0.000400743	0.3	0.704693	2.75884	1.55487
5	1995	318.168	0.02	0.127504	0.000400743	0.3	-1.85241	19.0635	17.8595
5	1996	332.817	0.12	0.133374	0.000400743	0.3	-0.105666	0.0620298	-1.14194
5	1997	596.044	0.43	0.238861	0.000400743	0.3	0.587905	1.92018	0.716208
5	1998	1735.65	0.42	0.69555	0.000400743	0.3	-0.504448	1.41371	0.209735
5	1999	2774.02	0.84	1.11167	0.000400743	0.3	-0.280217	0.43623	-0.767743
5	2000	2703.16	2.51	1.08327	0.000400743	0.3	0.840297	3.92277	2.7188
5	2001	3077.35	2.44	1.23323	0.000400743	0.3	0.682363	2.58677	1.3828
5	2002	3786.43	2.26	1.51739	0.000400743	0.3	0.398376	0.881686	-0.322287
5	2003	3616.27	2.67	1.4492	0.000400743	0.3	0.611069	2.07447	0.8705
5	2004	4881.05	1.64	1.95605	0.000400743	0.3	-0.17623	0.172538	-1.03143
5	2005	4626.72	1.34	1.85413	0.000400743	0.3	-0.324745	0.585883	-0.61809
5	2006	4860.92	2.47	1.94798	0.000400743	0.3	0.237425	0.313169	-0.890804
6	1982	215.778	-0.001	0.127912	0.000592793	0.16			
6	1983	256.683	-0.001	0.15216	0.000592793	0.16			
6	1984	200.678	-0.001	0.118961	0.000592793	0.16			
6	1985	158.701	-0.001	0.0940767	0.000592793	0.16			
6	1986	132.133	-0.001	0.0783278	0.000592793	0.16			
6	1987	110.717	-0.001	0.0656321	0.000592793	0.16			
6	1988	141.283	-0.001	0.0837517	0.000592793	0.16			
6	1989	68.6638	-0.001	0.0407034	0.000592793	0.16			
6	1990	76.4633	-0.001	0.0453269	0.000592793	0.16			
6	1991	98.2364	-0.001	0.0582338	0.000592793	0.16			
6	1992	86.0091	0.04	0.0509855	0.000592793	0.3	-0.242663	0.32714	-0.876833
6	1993	34.0871	0.04	0.0202066	0.000592793	0.3	0.682871	2.59062	1.38665
6	1994	55.6635	0.01	0.0329969	0.000592793	0.3	-1.19383	7.91793	6.71396
6	1995	82.6431	-0.001	0.0489902	0.000592793	0.16			
6	1996	62.5521	0.03	0.0370804	0.000592793	0.3	-0.211892	0.249434	-0.954539
6	1997	84.3759	0.15	0.0500174	0.000592793	0.3	1.09826	6.70102	5.49705
6	1998	230.562	0.12	0.136675	0.000592793	0.3	-0.130118	0.0940587	-1.10991
6	1999	704.886	0.41	0.417851	0.000592793	0.3	-0.0189682	0.00199884	-1.20197
6	2000	1489.09	1.08	0.882724	0.000592793	0.3	0.201704	0.226024	-0.977949
6	2001	1650.04	1.34	0.978134	0.000592793	0.3	0.314778	0.550474	-0.653499
6	2002	2114.66	1.33	1.25355	0.000592793	0.3	0.0591971	0.0194683	-1.1845
6	2003	2917.85	1.96	1.72968	0.000592793	0.3	0.125007	0.0868157	-1.11716
6	2004	3207.64	1.44	1.90146	0.000592793	0.3	-0.277981	0.429298	-0.774675
6	2005	3881.26	1.49	2.30078	0.000592793	0.3	-0.434473	1.0487	-0.155268
6	2006	4264.48	2.6	2.52795	0.000592793	0.3	0.0281023	0.00438745	-1.19959

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7 1985 29972.9 0.55 0.480269 1.60235e-005 0.4 0.135572 0.0574368 -0.858854  
7 1986 37849.5 1.48 0.60648 1.60235e-005 0.4 0.892125 2.48715 1.57086  
7 1987 40159 0.47 0.643486 1.60235e-005 0.4 -0.314168 0.308442 -0.607849  
7 1988 29732.7 0.6 0.476421 1.60235e-005 0.4 0.230627 0.166215 -0.750075  
7 1989 7783.54 0.06 0.124719 1.60235e-005 0.4 -0.731721 1.67317 0.756884  
7 1990 18538.6 0.63 0.297052 1.60235e-005 0.4 0.751813 1.76632 0.850031  
7 1991 24589.3 0.79 0.394005 1.60235e-005 0.4 0.695669 1.51236 0.596071  
7 1992 19712.8 0.77 0.315868 1.60235e-005 0.4 0.891066 2.48125 1.56496  
7 1993 24252.1 0.73 0.388603 1.60235e-005 0.4 0.630487 1.24223 0.325942  
7 1994 25207.8 0.35 0.403917 1.60235e-005 0.4 -0.143275 0.0641493 -0.852141  
7 1995 24200.9 0.79 0.387781 1.60235e-005 0.4 0.711591 1.58238 0.66609  
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INDEX\_1

Index Do\_Power Power Do\_Env\_var Env\_Link Do\_ExtraVar Qtype Q Num=0/Bio=1  
Err\_type N Npos r.m.s.e. mean\_input\_SE mean\_(Input+extra)\_SE pen\_mean\_Qdev  
rmse\_Qdev  
1 0 1.0 0 0.00 0.0 0 -- 1 0 0 0 0 0 0 0  
2 0 1.0 0 0.00 0.0 0 0.000168196 0 0 25 15 0.735114 0.3 0.3 0 0  
3 0 1.0 0 0.00 0.0 0 0.000468409 0 0 25 15 0.388446 0.3 0.3 0 0  
4 0 1.0 0 0.00 0.0 0 0.000378967 0 0 25 15 0.587199 0.3 0.3 0 0  
5 0 1.0 0 0.00 0.0 0 0.000400743 0 0 25 15 0.681712 0.3 0.3 0 0  
6 0 1.0 0 0.00 0.0 0 0.000592793 0 0 25 14 0.510219 0.3 0.3 0 0  
7 0 1.0 0 0.00 0.0 0 1.60235e-005 0 0 25 25 0.691856 0.4 0.4 0 0  
8 0 1.0 0 0.00 0.0 0 4.33039e-005 0 0 25 25 0.50874 0.4 0.4 0 0  
9 0 1.0 0 0.00 0.0 0 3.5748e-005 0 0 25 24 0.775298 0.4 0.4 0 0  
10 0 1.0 0 0.00 0.0 0 4.23331e-005 0 0 25 20 0.457672 0.4 0.4 0 0  
11 0 1.0 0 0.00 0.0 0 7.61515e-005 0 0 25 15 0.369693 0.4 0.4 0 0

12	0	1.0	0	0.00	0.0	0	9.2937e-006	0	0	25	25	0.708116	0.51	0.51	0	0
13	0	1.0	0	0.00	0.0	0	7.67662e-005	0	0	25	25	0.441899	0.51	0.51	0	0
14	0	1.0	0	0.00	0.0	0	9.69511e-005	0	0	25	25	0.745462	0.51	0.51	0	0
15	0	1.0	0	0.00	0.0	0	0.000100846	0	0	25	23	0.608126	0.51	0.51	0	0
16	0	1.0	0	0.00	0.0	0	4.69679e-005	0	0	25	25	0.905617	0.41	0.41	0	0
17	0	1.0	0	0.00	0.0	0	4.75558e-005	0	0	25	25	0.748541	0.41	0.41	0	0
18	0	1.0	0	0.00	0.0	0	0.000136271	0	0	25	24	1.38824	0.41	0.41	0	0
19	0	1.0	0	0.00	0.0	0	0.000753321	0	0	25	24	0.792281	0.41	0.41	0	0
20	0	1.0	0	0.00	0.0	0	2.02756e-005	0	0	25	23	0.747792	0.6	0.6	0	0
21	0	1.0	0	0.00	0.0	0	2.09241e-005	0	0	25	23	0.746703	0.6	0.6	0	0
22	0	1.0	0	0.00	0.0	0	3.45572e-005	0	0	25	22	0.773877	0.6	0.6	0	0
23	0	1.0	0	0.00	0.0	0	5.14376e-005	0	0	25	22	0.70061	0.6	0.6	0	0
24	0	1.0	0	0.00	0.0	0	0.000127172	0	0	25	22	0.523972	0.6	0.6	0	0
25	0	1.0	0	0.00	0.0	0	0.000106478	0	0	25	22	0.473347	0.6	0.6	0	0
26	0	1.0	0	0.00	0.0	0	7.93041e-005	0	0	25	22	0.835217	0.6	0.6	0	0
27	0	1.0	0	0.00	0.0	0	0.000125252	0	0	25	25	0.70709	0.6	0.6	0	0
28	0	1.0	0	0.00	0.0	0	9.89305e-005	0	0	25	20	0.868932	0.6	0.6	0	0
29	0	1.0	0	0.00	0.0	0	1.19787e-005	0	0	25	17	0.900723	0.6	0.6	0	0
30	0	1.0	0	0.00	0.0	0	2.0766e-005	0	0	25	17	0.877515	0.6	0.6	0	0
31	0	1.0	0	0.00	0.0	0	0.000182296	0	0	25	19	0.652598	0.6	0.6	0	0
32	0	1.0	0	0.00	0.0	0	7.93802e-005	0	0	25	19	0.972017	0.6	0.6	0	0
33	0	1.0	0	0.00	0.0	0	4.87617e-005	0	0	25	16	0.806493	0.6	0.6	0	0
34	0	1.0	0	0.00	0.0	0	6.94122e-005	0	0	25	15	0.784781	0.6	0.6	0	0
35	0	1.0	0	0.00	0.0	0	2.06377e-006	0	0	25	19	0.93437	0.6	0.6	0	0
36	0	1.0	0	0.00	0.0	0	3.2025e-005	0	0	25	25	0.558944	0.6	0.6	0	0
37	0	1.0	0	0.00	0.0	0	4.47349e-005	0	0	25	19	0.612632	0.6	0.6	0	0
38	0	1.0	0	0.00	0.0	0	0.000271218	0	0	25	25	0.611568	0.6	0.6	0	0
39	0	1.0	0	0.00	0.0	0	6.20708e-006	0	0	25	21	0.87444	0.6	0.6	0	0
40	0	1.0	0	0.00	0.0	0	1.97215e-005	0	0	25	15	1.14493	0.6	0.6	0	0

rmse\_Qdev\_not\_in\_logL

pen\_mean\_Qdev\_not\_in\_logL\_in\_randwalk\_approach

### INDEX\_3

Index Q\_parm assignments

1	0	--	0	--	0	0
2	0	--	0	--	0	0
3	0	--	0	--	0	0
4	0	--	0	--	0	0
5	0	--	0	--	0	0
6	0	--	0	--	0	0
7	0	--	0	--	0	0
8	0	--	0	--	0	0
9	0	--	0	--	0	0
10	0	--	0	--	0	0
11	0	--	0	--	0	0
12	0	--	0	--	0	0
13	0	--	0	--	0	0
14	0	--	0	--	0	0
15	0	--	0	--	0	0
16	0	--	0	--	0	0
17	0	--	0	--	0	0
18	0	--	0	--	0	0
19	0	--	0	--	0	0
20	0	--	0	--	0	0
21	0	--	0	--	0	0
22	0	--	0	--	0	0
23	0	--	0	--	0	0

24 0 -- 0 -- 0 0  
 25 0 -- 0 -- 0 0  
 26 0 -- 0 -- 0 0  
 27 0 -- 0 -- 0 0  
 28 0 -- 0 -- 0 0  
 29 0 -- 0 -- 0 0  
 30 0 -- 0 -- 0 0  
 31 0 -- 0 -- 0 0  
 32 0 -- 0 -- 0 0  
 33 0 -- 0 -- 0 0  
 34 0 -- 0 -- 0 0  
 35 0 -- 0 -- 0 0  
 36 0 -- 0 -- 0 0  
 37 0 -- 0 -- 0 0  
 38 0 -- 0 -- 0 0  
 39 0 -- 0 -- 0 0  
 40 0 -- 0 -- 0 0

DISCARD log(L)\_based\_on\_T-distribution\_with\_DF=\_30  
 as\_fraction  
 index year seas obs exp cv Dev Like Like+log(s)

MEAN\_BODY\_WT log(L)\_based\_on\_T-distribution\_with\_DF=\_30  
 year seas index Mkt obs exp cv Dev Like Like+log(s)  
 1982 1 1 0 0.504 0.619221 0.1 -0.115221 2.48929 2.48929  
 1983 1 1 0 0.521 0.598493 0.1 -0.0774935 1.10287 1.10287  
 1984 1 1 0 0.518 0.590682 0.1 -0.0726816 0.985202 0.985202  
 1985 1 1 0 0.575 0.631041 0.1 -0.0560408 0.483167 0.483167  
 1986 1 1 0 0.613 0.581626 0.1 0.031374 0.134753 0.134753  
 1987 1 1 0 0.581 0.578985 0.1 0.00201513 0.00062152 0.00062152  
 1988 1 1 0 0.588 0.6381 0.1 -0.0500996 0.370614 0.370614  
 1989 1 1 0 0.668 0.704673 0.1 -0.0366728 0.154943 0.154943  
 1990 1 1 0 0.54 0.558556 0.1 -0.0185558 0.0608879 0.0608879  
 1991 1 1 0 0.537 0.560992 0.1 -0.0239924 0.102794 0.102794  
 1992 1 1 0 0.595 0.589711 0.1 0.00528873 0.00408152 0.00408152  
 1993 1 1 0 0.571 0.566771 0.1 0.00422915 0.00283404 0.00283404  
 1994 1 1 0 0.605 0.588205 0.1 0.0167955 0.0397673 0.0397673  
 1995 1 1 0 0.675 0.717821 0.1 -0.0428207 0.206544 0.206544  
 1996 1 1 0 0.621 0.758726 0.1 -0.137726 2.35329 2.35329  
 1997 1 1 0 0.697 0.853032 0.1 -0.156032 2.39441 2.39441  
 1998 1 1 0 0.759 0.937301 0.1 -0.178301 2.61728 2.61728  
 1999 1 1 0 0.755 0.969756 0.1 -0.214756 3.70105 3.70105  
 2000 1 1 0 0.85 1.01567 0.1 -0.165674 1.84814 1.84814  
 2001 1 1 0 0.903 1.04998 0.1 -0.146984 1.3118 1.3118  
 2002 1 1 0 0.898 1.06486 0.1 -0.166865 1.68856 1.68856  
 2003 1 1 0 0.999 1.1078 0.1 -0.108801 0.601036 0.601036  
 2004 1 1 0 0.983 1.1556 0.1 -0.172604 1.51632 1.51632  
 2005 1 1 0 0.949 1.18586 0.1 -0.23686 2.92448 2.92448  
 2006 1 1 0 0.947 1.19757 0.1 -0.250569 3.25105 3.25105

FIT\_LEN\_COMPS

Index Year Seas Gender Mkt Nsamp effN Like

index N Npos mean\_effN mean(inputN) HarMean(effN) Mean(effN/inputN)  
 MeaneffN/MeaninputN  
 1 0 0 0 0 0 0 -1.#IND

2 0 0 0 0 0 0 -1.#IND  
 3 0 0 0 0 0 0 -1.#IND  
 4 0 0 0 0 0 0 -1.#IND  
 5 0 0 0 0 0 0 -1.#IND  
 6 0 0 0 0 0 0 -1.#IND  
 7 0 0 0 0 0 0 -1.#IND  
 8 0 0 0 0 0 0 -1.#IND  
 9 0 0 0 0 0 0 -1.#IND  
 10 0 0 0 0 0 0 -1.#IND  
 11 0 0 0 0 0 0 -1.#IND  
 12 0 0 0 0 0 0 -1.#IND  
 13 0 0 0 0 0 0 -1.#IND  
 14 0 0 0 0 0 0 -1.#IND  
 15 0 0 0 0 0 0 -1.#IND  
 16 0 0 0 0 0 0 -1.#IND  
 17 0 0 0 0 0 0 -1.#IND  
 18 0 0 0 0 0 0 -1.#IND  
 19 0 0 0 0 0 0 -1.#IND  
 20 0 0 0 0 0 0 -1.#IND  
 21 0 0 0 0 0 0 -1.#IND  
 22 0 0 0 0 0 0 -1.#IND  
 23 0 0 0 0 0 0 -1.#IND  
 24 0 0 0 0 0 0 -1.#IND  
 25 0 0 0 0 0 0 -1.#IND  
 26 0 0 0 0 0 0 -1.#IND  
 27 0 0 0 0 0 0 -1.#IND  
 28 0 0 0 0 0 0 -1.#IND  
 29 0 0 0 0 0 0 -1.#IND  
 30 0 0 0 0 0 0 -1.#IND  
 31 0 0 0 0 0 0 -1.#IND  
 32 0 0 0 0 0 0 -1.#IND  
 33 0 0 0 0 0 0 -1.#IND  
 34 0 0 0 0 0 0 -1.#IND  
 35 0 0 0 0 0 0 -1.#IND  
 36 0 0 0 0 0 0 -1.#IND  
 37 0 0 0 0 0 0 -1.#IND  
 38 0 0 0 0 0 0 -1.#IND  
 39 0 0 0 0 0 0 -1.#IND  
 40 0 0 0 0 0 0 -1.#IND

FIT\_AGE\_COMPS

Index	Year	Seas	Gender	Mkt	Ageerr	Lbin_lo	Lbin_hi	Nsamp	effN	Like
1	1982	1	0	0	1	1	70	152.766	76.7753	6.94297
1	1983	1	0	0	1	1	70	128.547	136.919	1.64938
1	1984	1	0	0	1	1	70	98.739	58.403	2.3275
1	1985	1	0	0	1	1	70	121.095	41.1938	3.1194
1	1986	1	0	0	1	1	70	145.314	33.0397	5.67836
1	1987	1	0	0	1	1	70	122.958	62.0682	2.66351
1	1988	1	0	0	1	1	70	167.67	2680.39	0.633005
1	1989	1	0	0	1	1	70	156.492	372.092	1.40647
1	1990	1	0	0	1	1	70	63.342	573.118	0.217351
1	1991	1	0	0	1	1	70	85.698	59.5326	1.67836
1	1992	1	0	0	1	1	70	63.342	207.712	0.496468
1	1993	1	0	0	1	1	70	67.068	156.05	1.10289
1	1994	1	0	0	1	1	70	74.52	131.993	0.454891
1	1995	1	0	0	1	1	70	55.89	597.119	0.394825
1	1996	1	0	0	1	1	70	85.698	47.2827	2.11532

```

1 1997 1 0 0 1 1 70 165.807 897.926 3.1689
1 1998 1 0 0 1 1 70 188.163 330.883 2.32368
1 1999 1 0 0 1 1 70 195.615 300.509 1.48002
1 2000 1 0 0 1 1 70 204.93 185.764 4.53811
1 2001 1 0 0 1 1 70 191.889 148.25 5.11785
1 2002 1 0 0 1 1 70 137.862 100.321 4.25713
1 2003 1 0 0 1 1 70 162.081 1544.24 1.57472
1 2004 1 0 0 1 1 70 260.82 349.134 2.4554
1 2005 1 0 0 1 1 70 320.436 489.656 4.24492
1 2006 1 0 0 1 1 70 337.203 468.529 2.47418

```

```

index N Npos mean_effN mean(inputN) HarMean(effN) Mean(effN/inputN)
MeaneffN/MeaninputN

```

```

1 0 25 401.956 150.158 119.859 2.99406 2.67689
2 0 0 0 0 0 0 -1.#IND
3 0 0 0 0 0 0 -1.#IND
4 0 0 0 0 0 0 -1.#IND
5 0 0 0 0 0 0 -1.#IND
6 0 0 0 0 0 0 -1.#IND
7 0 0 0 0 0 0 -1.#IND
8 0 0 0 0 0 0 -1.#IND
9 0 0 0 0 0 0 -1.#IND
10 0 0 0 0 0 0 -1.#IND
11 0 0 0 0 0 0 -1.#IND
12 0 0 0 0 0 0 -1.#IND
13 0 0 0 0 0 0 -1.#IND
14 0 0 0 0 0 0 -1.#IND
15 0 0 0 0 0 0 -1.#IND
16 0 0 0 0 0 0 -1.#IND
17 0 0 0 0 0 0 -1.#IND
18 0 0 0 0 0 0 -1.#IND
19 0 0 0 0 0 0 -1.#IND
20 0 0 0 0 0 0 -1.#IND
21 0 0 0 0 0 0 -1.#IND
22 0 0 0 0 0 0 -1.#IND
23 0 0 0 0 0 0 -1.#IND
24 0 0 0 0 0 0 -1.#IND
25 0 0 0 0 0 0 -1.#IND
26 0 0 0 0 0 0 -1.#IND
27 0 0 0 0 0 0 -1.#IND
28 0 0 0 0 0 0 -1.#IND
29 0 0 0 0 0 0 -1.#IND
30 0 0 0 0 0 0 -1.#IND
31 0 0 0 0 0 0 -1.#IND
32 0 0 0 0 0 0 -1.#IND
33 0 0 0 0 0 0 -1.#IND
34 0 0 0 0 0 0 -1.#IND
35 0 0 0 0 0 0 -1.#IND
36 0 0 0 0 0 0 -1.#IND
37 0 0 0 0 0 0 -1.#IND
38 0 0 0 0 0 0 -1.#IND
39 0 0 0 0 0 0 -1.#IND
40 0 0 0 0 0 0 -1.#IND

```

```

LEN_SELECT

```

```

fleet year gender label 10.5 11.5 12.5 13.5 14.5 15.5 16.5 17.5 18.5 19.5
20.5 21.5 22.5 23.5 24.5 25.5 26.5 27.5 28.5 29.5 30.5 31.5 32.5 33.5 34.5

```













1 2007 1 2007-1 0.00978427 0.145956 0.677984 0.999163 0.999989 0.999945  
 0.99966 0.999127 0.998348 0.997323 0.996054 0.99454 0.992784 0.990787  
 0.988549 0.986073  
 2 1982 1 1982-2 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 2 2006 1 2006-2 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 3 1982 1 1982-3 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 3 2006 1 2006-3 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 4 1982 1 1982-4 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 4 2006 1 2006-4 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 5 1982 1 1982-5 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0  
 5 2006 1 2006-5 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0  
 6 1982 1 1982-6 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1  
 6 2006 1 2006-6 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1  
 7 1982 1 1982-7 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 7 2006 1 2006-7 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 8 1982 1 1982-8 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 8 2006 1 2006-8 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 9 1982 1 1982-9 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 9 2006 1 2006-9 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 10 1982 1 1982-10 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0  
 10 2006 1 2006-10 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0  
 11 1982 1 1982-11 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1  
 11 2006 1 2006-11 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1  
 12 1982 1 1982-12 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 12 2006 1 2006-12 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 13 1982 1 1982-13 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 13 2006 1 2006-13 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 14 1982 1 1982-14 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 14 2006 1 2006-14 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 15 1982 1 1982-15 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0  
 15 2006 1 2006-15 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0  
 16 1982 1 1982-16 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 16 2006 1 2006-16 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 17 1982 1 1982-17 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 17 2006 1 2006-17 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 18 1982 1 1982-18 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 18 2006 1 2006-18 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 19 1982 1 1982-19 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0  
 19 2006 1 2006-19 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0  
 20 1982 1 1982-20 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 20 2006 1 2006-20 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 21 1982 1 1982-21 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 21 2006 1 2006-21 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 22 1982 1 1982-22 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0  
 22 2006 1 2006-22 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0  
 23 1982 1 1982-23 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 23 2006 1 2006-23 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 24 1982 1 1982-24 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 24 2006 1 2006-24 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 25 1982 1 1982-25 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0  
 25 2006 1 2006-25 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0  
 26 1982 1 1982-26 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1  
 26 2006 1 2006-26 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1  
 27 1982 1 1982-27 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 27 2006 1 2006-27 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 28 1982 1 1982-28 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0  
 28 2006 1 2006-28 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0



31 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
32 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
33 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
34 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
35 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
36 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
37 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
38 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
39 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
40 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

AGE\_SELECT\_mortality\_in\_endyear

fleet year morph season label 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15  
1 2006 1 1 sel\*wt 0.00175216 0.0650588 0.547453 1.22351 1.66059 2.08805  
2.48758 2.84635 3.15658 3.41595 3.62709 3.7956 3.92812 4.03111 4.1102 4.17007  
1 2006 1 1 sel\*ret\*wt 0.00175216 0.0650588 0.547453 1.22351 1.66059 2.08805  
2.48758 2.84635 3.15658 3.41595 3.62709 3.7956 3.92812 4.03111 4.1102 4.17007  
1 2006 1 1 sel\_nums 0.00978427 0.145956 0.677984 0.999163 0.999989 0.999945  
0.99966 0.999127 0.998348 0.997323 0.996054 0.99454 0.992784 0.990787  
0.988549 0.986073  
1 2006 1 1 sel\*ret\_nums 0.00978427 0.145956 0.677984 0.999163 0.999989  
0.999945 0.99966 0.999127 0.998348 0.997323 0.996054 0.99454 0.992784  
0.990787 0.988549 0.986073  
1 2006 1 1 dead\_nums 0.00978427 0.145956 0.677984 0.999163 0.999989 0.999945  
0.99966 0.999127 0.998348 0.997323 0.996054 0.99454 0.992784 0.990787  
0.988549 0.986073  
1 2006 1 1 dead\*wt 0.00175216 0.0650588 0.547453 1.22351 1.66059 2.08805  
2.48758 2.84635 3.15658 3.41595 3.62709 3.7956 3.92812 4.03111 4.1102 4.17007

ENVIRONMENTAL\_DATA Begins\_in\_startyr-1

NUMBERS\_AT\_AGE

Population 1 gmorph 1 gender: 1 GrowPattern: 1 birthseason: 1  
Year Per Seas 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15  
1980 VIRG 1 45141.5 36958.7 30259.2 24774.2 20283.4 16606.6 13596.3 11131.7  
9113.9 7461.83 6109.23 5001.82 4095.14 3352.82 2745.06 12373.3  
1981 INIT 1 48302.3 37579.7 15661.9 3459.49 762.742 168.175 37.0935 8.18712  
1.80884 0.400171 0.088676 0.0196889 0.00438156 0.000977613 0.000218762  
6.33933e-005  
1982 TIME 1 59260.4 37579.7 15661.9 3459.49 762.742 168.175 37.0935 8.18712  
1.80884 0.400171 0.088676 0.0196889 0.00438156 0.000977613 0.000218762  
6.33933e-005  
1983 TIME 1 63849.3 46417.5 17125.8 4114.39 907.354 200.059 44.124 9.73797  
2.1512 0.475827 0.105418 0.0234 0.00520587 0.00116113 0.000259728 7.52244e-  
005  
1984 TIME 1 38877.9 49202.1 17042.9 2958.36 709.173 156.403 34.4992 7.61513  
1.68263 0.372293 0.0825094 0.0183225 0.00407817 0.000910089 0.000203694  
5.90414e-005  
1985 TIME 1 48873.9 29972.9 18174.3 2978.61 515.91 123.679 27.288 6.02398  
1.33127 0.294616 0.0653124 0.0145085 0.00323052 0.00072125 0.00016151  
4.68484e-005  
1986 TIME 1 52333.3 37849.5 11752.2 3566.24 583.297 101.034 24.2304 5.35004  
1.18235 0.261671 0.0580131 0.0128883 0.00287015 0.000640898 0.000143544  
4.16501e-005  
1987 TIME 1 38266.1 40159 13146 1822.64 551.79 90.2559 15.6405 3.7542  
0.829982 0.183733 0.040748 0.00905655 0.00201787 0.000450856 0.000101049  
2.93488e-005

1988 TIME 1 10213.5 29732.7 16451.2 2808.39 388.637 117.661 19.2528 3.33867  
 0.802208 0.177594 0.0393805 0.00875137 0.00194962 0.000435553 9.76077e-005  
 2.83472e-005  
 1989 TIME 1 24033.7 7783.54 9424.47 2136.67 363.804 50.3475 15.2505 2.49782  
 0.433764 0.104418 0.0231698 0.00515201 0.00114859 0.00025682 5.76104e-005  
 1.67546e-005  
 1990 TIME 1 31629 18538.6 2895.29 1669.65 377.718 64.3159 8.9045 2.69937  
 0.442637 0.0769862 0.0185683 0.00412968 0.000920726 0.000205893 4.61939e-005  
 1.34391e-005  
 1991 TIME 1 25499.1 24589.3 7649.87 627.328 361.088 81.6906 13.9149 1.92784  
 0.585015 0.0960587 0.0167351 0.00404439 0.000901583 0.000201543 4.52026e-005  
 1.31457e-005  
 1992 TIME 1 31507 19712.8 9420.76 1435.19 117.448 67.6059 15.3009 2.6083  
 0.361776 0.109947 0.0180866 0.00315798 0.000765157 0.00017107 3.83673e-005  
 1.11581e-005  
 1993 TIME 1 32505.9 24252.1 7131.67 1581.37 240.372 19.6717 11.3284 2.566  
 0.437951 0.060842 0.0185273 0.00305506 0.0005349 0.000130011 2.91701e-005  
 8.48611e-006  
 1994 TIME 1 31111.1 25207.8 9681.42 1449.03 320.674 48.7453 3.99076 2.29983  
 0.521495 0.0891314 0.0124042 0.00378519 0.000625678 0.000109852 2.67833e-005  
 7.79078e-006  
 1995 TIME 1 31691.4 24200.9 10483.5 2129.73 318.168 70.4141 10.7074 0.877211  
 0.506036 0.114898 0.0196703 0.00274289 0.000838922 0.000139033 2.44819e-005  
 7.73652e-006  
 1996 TIME 1 23202.9 25529.3 15556.2 2789.92 332.817 49.6527 10.9895 1.67189  
 0.137092 0.0791863 0.0180102 0.00308981 0.000431934 0.000132494 2.20308e-005  
 5.12927e-006  
 1997 TIME 1 25149.1 18748.7 17177.1 5118.47 596.044 71.0247 10.5968 2.34625  
 0.357204 0.0293207 0.0169594 0.00386386 0.000664229 9.30741e-005 2.86268e-005  
 5.88964e-006  
 1998 TIME 1 28072.7 20413.3 13495.5 7732.66 1735.65 201.969 24.0675 3.59174  
 0.795629 0.121213 0.00995866 0.00576666 0.00131557 0.000226508 3.17951e-005  
 1.18189e-005  
 1999 TIME 1 22476.6 22799 14815.2 6311.96 2774.02 622.224 72.4076 8.63047  
 1.28854 0.285617 0.0435503 0.00358176 0.00207665 0.000474442 8.18217e-005  
 1.57926e-005  
 2000 TIME 1 28045.7 18285.9 16980.3 7814.12 2703.16 1187.36 266.338 30.9992  
 3.69617 0.552122 0.122464 0.0186885 0.00153853 0.000893031 0.000204291  
 4.2104e-005  
 2001 TIME 1 26900.5 22797.9 13453.2 8460.83 3077.35 1063.91 467.34 104.851  
 12.2084 1.45649 0.21773 0.0483388 0.00738486 0.000608741 0.000353858 9.7823e-  
 005  
 2002 TIME 1 27480.8 21894.4 17089 7310.84 3786.43 1376.5 475.902 209.083  
 46.9245 5.46627 0.652542 0.0976227 0.0216933 0.00331767 0.00027381  
 0.000203505  
 2003 TIME 1 20750 22388.6 16653.5 9939.34 3616.27 1872.16 680.613 235.344  
 103.424 23.2205 2.70638 0.323283 0.0484013 0.0107651 0.00164802 0.000237495  
 2004 TIME 1 30293.8 16903.8 17011.4 9638.67 4881.05 1775.14 919.02 334.153  
 115.576 50.8111 11.414 1.33117 0.159135 0.0238468 0.00530926 0.000931136  
 2005 TIME 1 16112.3 24673.2 12801.3 9694.74 4626.72 2341.95 851.742 441.028  
 160.402 55.5025 24.4141 5.488 0.640566 0.0766484 0.0114982 0.00301313  
 2006 TIME 1 32222.4 13128.4 18804.3 7514.34 4860.92 2318.89 1173.8 426.958  
 221.134 80.4575 27.854 12.2599 2.75792 0.322185 0.0385896 0.0073158  
 2007 FORE 1 40143.5 26270.7 10094.2 11499.4 4002.01 2587.92 1234.58 625.011  
 227.394 117.814 42.8842 14.8544 6.54241 1.47286 0.17221 0.0245646

CATCH\_AT\_AGE

```

fleet 1 fleetarea 1 gmorph 1
Year Seas 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
1981 E 2179.22 16909.4 10586.3 2340.03 515.916 113.737 25.08 5.53341 1.22191
0.270152 0.059819 0.0132699 0.0029501 0.000657477 0.000146939 4.25207e-005
1982 1 2327.32 15248.6 9819.77 2170.75 478.594 105.508 23.2647 5.13271
1.13337 0.250561 0.0554766 0.0123056 0.00273543 0.000609564 0.000136213
3.94117e-005
1983 1 3405.54 23511.1 12553.7 3017.85 665.523 146.721 32.3527 7.1377
1.57607 0.348422 0.0771406 0.01711 0.00380314 0.000847422 0.000189347
5.47732e-005
1984 1 2058.53 24796.9 12451.7 2162.75 518.443 114.325 25.2119 5.56324
1.2287 0.271706 0.0601765 0.0133527 0.00296938 0.000661988 0.000148 4.28457e-
005
1985 1 2398.96 14328.4 12814 2101.5 363.986 87.247 19.2451 4.24693 0.938101
0.207483 0.0459633 0.0102018 0.00226943 0.000506135 0.000113204 3.27938e-005
1986 1 2978.72 20031.5 8863.98 2691.37 440.198 76.2393 18.28 4.03493
0.891339 0.197164 0.0436844 0.00969799 0.00215789 0.0004814 0.000107709
3.12165e-005
1987 1 1769.32 18394.8 8998.06 1248.42 377.944 61.8117 10.7087 2.56943
0.567767 0.125608 0.0278364 0.00618146 0.00137591 0.000307078 6.87387e-005
1.99373e-005
1988 1 641.2 16773.1 12912 2205.36 305.184 92.3862 15.1141 2.62023 0.629344
0.13926 0.0308627 0.00685399 0.00152578 0.000340576 7.62517e-005 2.2122e-005
1989 1 1261.68 3899.66 6858.66 1555.94 264.921 36.6585 11.1015 1.81765
0.315505 0.0759075 0.0168321 0.00373984 0.000833017 0.000186071 4.16931e-005
1.21105e-005
1990 1 1447.44 8428.42 1971.37 1137.65 257.361 43.8163 6.06477 1.83781
0.301208 0.0523551 0.012618 0.00280385 0.000624502 0.000139494 3.12575e-005
9.0811e-006
1991 1 1289.87 12006.4 5471.92 449.016 258.449 58.4627 9.95597 1.37887
0.41823 0.0686329 0.0119487 0.00288533 0.000642609 0.000143501 3.21477e-005
9.33722e-006
1992 1 1710.56 10106.3 6960.85 1061.08 86.8322 49.9768 11.3085 1.92709
0.267173 0.081152 0.013341 0.00232762 0.000563477 0.000125857 2.81961e-005
8.19029e-006
1993 1 1557.64 11397.3 4969.48 1102.67 167.607 13.7149 7.89605 1.78789
0.304998 0.0423459 0.0128856 0.00212297 0.000371345 9.01601e-005 2.02044e-005
5.86999e-006
1994 1 1407.9 11367.8 6554.25 981.679 217.244 33.0186 2.70252 1.55683
0.352837 0.060267 0.00838087 0.00255518 0.000421937 7.39961e-005 1.80184e-005
5.23395e-006
1995 1 462.2 4732.41 6531.22 1603.29 239.604 53.0261 8.06238 0.660369
0.380824 0.0864313 0.014789 0.00206092 0.000629875 0.000104301 1.83486e-005
5.79223e-006
1996 1 274.911 4136.58 8559.77 1909.6 227.894 33.9986 7.52375 1.14433
0.0937963 0.0541506 0.0123083 0.00211 0.000294705 9.03088e-005 1.49995e-005
3.48785e-006
1997 1 195.933 2057.45 7077.81 2757.23 321.247 38.2788 5.71008 1.26385
0.192319 0.015776 0.00911759 0.00207524 0.000356348 4.98685e-005 1.53159e-005
3.14601e-006
1998 1 204.791 2105.18 5292.92 3991.25 896.349 104.301 12.4266 1.85385
0.410447 0.0624891 0.00512969 0.00296742 0.000676184 0.000116267 1.62962e-005
6.04761e-006
1999 1 128.878 1869.3 4812.26 2757.7 1212.69 272.003 31.6462 3.77056
0.562632 0.12462 0.0189844 0.00155964 0.000903102 0.000206027 3.54731e-005
6.83434e-006

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2000 1 181.542 1683.41 6073.47 3720.14 1287.65 565.585 126.842 14.7577  
 1.75868 0.262519 0.0581773 0.00886875 0.000729228 0.000422687 9.65432e-005  
 1.98628e-005  
 2001 1 143.8 1747.62 4128.04 3511.65 1278.03 441.83 194.04 43.517 5.06403  
 0.603692 0.0901605 0.0199943 0.0030506 0.00025109 0.000145713 4.02072e-005  
 2002 1 122.613 1409.99 4511.05 2644.85 1370.7 498.282 172.234 75.638 16.9651  
 1.9747 0.235499 0.0351899 0.007809 0.0011924 9.82361e-005 7.28701e-005  
 2003 1 93.9061 1461.75 4449.2 3635.7 1323.64 685.231 249.057 86.0839 37.8075  
 8.4817 0.987575 0.117829 0.017617 0.00391213 0.000597855 8.5989e-005  
 2004 1 143.196 1151.04 4714.29 3646.18 1847.6 671.915 347.785 126.402  
 43.6934 19.194 4.30745 0.501779 0.059904 0.00896291 0.00199204 0.000348692  
 2005 1 69.9594 1547.65 3302.09 3433.43 1639.63 829.92 301.765 156.187  
 56.7708 19.6281 8.62529 1.93655 0.225724 0.0269668 0.00403819 0.00105613  
 2006 1 122.729 725.209 4334.14 2397.34 1551.84 740.274 374.633 136.21  
 70.5031 25.6306 8.86404 3.89671 0.875332 0.102091 0.0122056 0.00230924

BIOLOGY 1 70 15 1 N\_Used\_morphs;\_lengths;\_ages;\_season;\_by\_season\_in\_endyr  
 bin low Mean\_Size Wt\_len-F mat\_len spawn Wt\_len-M

1 10 10.5 0.0063863 1 0.0063863  
 2 11 11.5 0.00865928 1 0.00865928  
 3 12 12.5 0.0114467 1 0.0114467  
 4 13 13.5 0.0148098 1 0.0148098  
 5 14 14.5 0.0188113 1 0.0188113  
 6 15 15.5 0.0235157 1 0.0235157  
 7 16 16.5 0.0289892 1 0.0289892  
 8 17 17.5 0.0352991 1 0.0352991  
 9 18 18.5 0.0425145 1 0.0425145  
 10 19 19.5 0.0507059 1 0.0507059  
 11 20 20.5 0.0599448 1 0.0599448  
 12 21 21.5 0.0703042 1 0.0703042  
 13 22 22.5 0.0818585 1 0.0818585  
 14 23 23.5 0.0946829 1 0.0946829  
 15 24 24.5 0.108854 1 0.108854  
 16 25 25.5 0.12445 1 0.12445  
 17 26 26.5 0.14155 1 0.14155  
 18 27 27.5 0.160232 1 0.160232  
 19 28 28.5 0.180579 1 0.180579  
 20 29 29.5 0.202673 1 0.202673  
 21 30 30.5 0.226596 1 0.226596  
 22 31 31.5 0.252433 1 0.252433  
 23 32 32.5 0.280267 1 0.280267  
 24 33 33.5 0.310187 1 0.310187  
 25 34 34.5 0.342277 1 0.342277  
 26 35 35.5 0.376627 1 0.376627  
 27 36 36.5 0.413324 1 0.413324  
 28 37 37.5 0.452458 1 0.452458  
 29 38 38.5 0.494119 1 0.494119  
 30 39 39.5 0.538399 1 0.538399  
 31 40 40.5 0.58539 1 0.58539  
 32 41 41.5 0.635184 1 0.635184  
 33 42 42.5 0.687876 1 0.687876  
 34 43 43.5 0.743558 1 0.743558  
 35 44 44.5 0.802328 1 0.802328  
 36 45 45.5 0.86428 1 0.86428  
 37 46 46.5 0.929512 1 0.929512  
 38 47 47.5 0.99812 1 0.99812  
 39 48 48.5 1.0702 1 1.0702



40 49 49.5 1.14586 1 1.14586  
41 50 50.5 1.22519 1 1.22519  
42 51 51.5 1.3083 1 1.3083  
43 52 52.5 1.39527 1 1.39527  
44 53 53.5 1.48623 1 1.48623  
45 54 54.5 1.58127 1 1.58127  
46 55 55.5 1.68048 1 1.68048  
47 56 56.5 1.78398 1 1.78398  
48 57 57.5 1.89188 1 1.89188  
49 58 58.5 2.00426 1 2.00426  
50 59 59.5 2.12125 1 2.12125  
51 60 60.5 2.24294 1 2.24294  
52 61 61.5 2.36945 1 2.36945  
53 62 62.5 2.50088 1 2.50088  
54 63 63.5 2.63734 1 2.63734  
55 64 64.5 2.77893 1 2.77893  
56 65 65.5 2.92577 1 2.92577  
57 66 66.5 3.07797 1 3.07797  
58 67 67.5 3.23564 1 3.23564  
59 68 68.5 3.39888 1 3.39888  
60 69 69.5 3.56782 1 3.56782  
61 70 70.5 3.74255 1 3.74255  
62 71 71.5 3.9232 1 3.9232  
63 72 72.5 4.10988 1 4.10988  
64 73 73.5 4.30271 1 4.30271  
65 74 74.5 4.50178 1 4.50178  
66 75 75.5 4.70723 1 4.70723  
67 76 76.5 4.91917 1 4.91917  
68 77 77.5 5.13771 1 5.13771  
69 78 78.5 5.36296 1 5.36296  
70 79 79.5 5.59506 1 5.59506

Growth\_Parameters

Count Yr Morph A1 A2 L-at-A1 L-at-A2 K A-at-L0 Linf CVmin CVmax natM\_amin  
natM\_max M\_young M\_old  
1 1982 1 0.5 6 28.1 60.2 0.2052 -1.76669 75.5491 0.1 0.1 0 2 0.2 0.2

Season gmorph GrowPattern Sex BirthSeas age age\_Beg age\_Mid M Len\_Beg Len\_Mid  
SD\_Beg SD\_Mid Wt\_Beg Wt\_Mid Len\_Mat Age\_Mat Mat\*Fecund Len:\_1 SelWt:\_1  
RetWt:\_1 Len:\_2 SelWt:\_2 RetWt:\_2 Len:\_3 SelWt:\_3 RetWt:\_3 Len:\_4 SelWt:\_4  
RetWt:\_4 Len:\_5 SelWt:\_5 RetWt:\_5 Len:\_6 SelWt:\_6 RetWt:\_6 Len:\_7 SelWt:\_7  
RetWt:\_7 Len:\_8 SelWt:\_8 RetWt:\_8 Len:\_9 SelWt:\_9 RetWt:\_9 Len:\_10 SelWt:\_10  
RetWt:\_10 Len:\_11 SelWt:\_11 RetWt:\_11 Len:\_12 SelWt:\_12 RetWt:\_12 Len:\_13  
SelWt:\_13 RetWt:\_13 Len:\_14 SelWt:\_14 RetWt:\_14 Len:\_15 SelWt:\_15 RetWt:\_15  
Len:\_16 SelWt:\_16 RetWt:\_16 Len:\_17 SelWt:\_17 RetWt:\_17 Len:\_18 SelWt:\_18  
RetWt:\_18 Len:\_19 SelWt:\_19 RetWt:\_19 Len:\_20 SelWt:\_20 RetWt:\_20 Len:\_21  
SelWt:\_21 RetWt:\_21 Len:\_22 SelWt:\_22 RetWt:\_22 Len:\_23 SelWt:\_23 RetWt:\_23  
Len:\_24 SelWt:\_24 RetWt:\_24 Len:\_25 SelWt:\_25 RetWt:\_25 Len:\_26 SelWt:\_26  
RetWt:\_26 Len:\_27 SelWt:\_27 RetWt:\_27 Len:\_28 SelWt:\_28 RetWt:\_28 Len:\_29  
SelWt:\_29 RetWt:\_29 Len:\_30 SelWt:\_30 RetWt:\_30 Len:\_31 SelWt:\_31 RetWt:\_31  
Len:\_32 SelWt:\_32 RetWt:\_32 Len:\_33 SelWt:\_33 RetWt:\_33 Len:\_34 SelWt:\_34  
RetWt:\_34 Len:\_35 SelWt:\_35 RetWt:\_35 Len:\_36 SelWt:\_36 RetWt:\_36 Len:\_37  
SelWt:\_37 RetWt:\_37 Len:\_38 SelWt:\_38 RetWt:\_38 Len:\_39 SelWt:\_39 RetWt:\_39  
Len:\_40 SelWt:\_40 RetWt:\_40  
1 1 1 1 1 0 0 0.5 0.2 10 28.1 1 2.81 0.006815 0.17908 1 0.38 0.0025897 28.1  
0.17908 0.17908 28.1 0.17908 0.17908 28.1 0.17908 0.17908 28.1 0.17908  
0.17908 28.1 0.17908 0.17908 28.1 0.17908 0.17908 28.1 0.17908 0.17908 28.1











1 2005 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539  
1 2006 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539  
1 2007 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539

MEAN\_SIZE\_TIMESERIES

morph year season beg/mid 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15  
1 1982 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
1 1982 1 1 28.1 36.9026 44.0721 49.9116 54.6677 58.5416 61.6967 64.2666  
66.3596 68.0644 69.453 70.5839 71.505 72.2553 72.8663 73.364  
1 1983 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
1 1983 1 1 28.1 36.9026 44.0721 49.9116 54.6677 58.5416 61.6967 64.2666  
66.3596 68.0644 69.453 70.5839 71.505 72.2553 72.8663 73.364  
1 1984 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
1 1984 1 1 28.1 36.9026 44.0721 49.9116 54.6677 58.5416 61.6967 64.2666  
66.3596 68.0644 69.453 70.5839 71.505 72.2553 72.8663 73.364  
1 1985 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
1 1985 1 1 28.1 36.9026 44.0721 49.9116 54.6677 58.5416 61.6967 64.2666  
66.3596 68.0644 69.453 70.5839 71.505 72.2553 72.8663 73.364  
1 1986 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
1 1986 1 1 28.1 36.9026 44.0721 49.9116 54.6677 58.5416 61.6967 64.2666  
66.3596 68.0644 69.453 70.5839 71.505 72.2553 72.8663 73.364  
1 1987 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
1 1987 1 1 28.1 36.9026 44.0721 49.9116 54.6677 58.5416 61.6967 64.2666  
66.3596 68.0644 69.453 70.5839 71.505 72.2553 72.8663 73.364  
1 1988 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
1 1988 1 1 28.1 36.9026 44.0721 49.9116 54.6677 58.5416 61.6967 64.2666  
66.3596 68.0644 69.453 70.5839 71.505 72.2553 72.8663 73.364  
1 1989 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
1 1989 1 1 28.1 36.9026 44.0721 49.9116 54.6677 58.5416 61.6967 64.2666  
66.3596 68.0644 69.453 70.5839 71.505 72.2553 72.8663 73.364  
1 1990 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
1 1990 1 1 28.1 36.9026 44.0721 49.9116 54.6677 58.5416 61.6967 64.2666  
66.3596 68.0644 69.453 70.5839 71.505 72.2553 72.8663 73.364  
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sdbetween 1e-006

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Composition\_Database

year	season	fleet	rep	pick_gender	kind	mkt	ageerr	gender	Lbin_lo	Lbin_hi	bin								
obs	exp	Pearson	N	effN	Like	Used													
1982	1	1	1	0	AGE	0	1	1	1	70	0	0.146828	0.0803743	3.02112	152.766	76.7753	13.5158	1	
1982	1	1	1	0	AGE	0	1	1	1	70	1	0.533389	0.514038	0.47855	152.766	76.7753	3.0112	1	
1982	1	1	1	0	AGE	0	1	1	1	70	2	0.278757	0.315626	-0.980484	152.766	76.7753	-5.28974	1	
1982	1	1	1	0	AGE	0	1	1	1	70	3	0.0257718	0.0698377	-2.13694	152.766	76.7753	-3.92482	1	
1982	1	1	1	0	AGE	0	1	1	1	70	4	0.00910569	0.0154754	-0.637818	152.766	76.7753	-0.737738	1	
1982	1	1	1	0	AGE	0	1	1	1	70	5	0.00328489	0.00348961	-0.042909	152.766	76.7753	-0.0303387	1	
1982	1	1	1	0	AGE	0	1	1	1	70	6	0.00193951	0.000847401	0.463895	152.766	76.7753	0.245335	1	
1982	1	1	1	0	AGE	0	1	1	1	70	7	0.000923618	0.000311614	0.428574	152.766	76.7753	0.153307	1	
1982	1	1	1	0	AGE	0	1	1	1	70									
1983	1	1	1	0	AGE	0	1	1	1	70	0	0.103629	0.0840048	0.802107	128.547	136.919	2.79675	1	
1983	1	1	1	0	AGE	0	1	1	1	70	1	0.597964	0.557394	0.926066	128.547	136.919	5.40044	1	
1983	1	1	1	0	AGE	0	1	1	1	70	2	0.229462	0.273737	-1.12582	128.547	136.919	-5.20403	1	
1983	1	1	1	0	AGE	0	1	1	1	70	3	0.0459472	0.0658604	-0.91024	128.547	136.919	-2.12657	1	
1983	1	1	1	0	AGE	0	1	1	1	70	4	0.0146676	0.0146021	0.00619021	128.547	136.919	0.00843766	1	
1983	1	1	1	0	AGE	0	1	1	1	70	5	0.00688977	0.00329726	0.71051	128.547	136.919	0.652683	1	
1983	1	1	1	0	AGE	0	1	1	1	70	6	0.000436259	0.000805028	-0.147419	128.547	136.919	-0.0343568	1	
1983	1	1	1	0	AGE	0	1	1	1	70	7	0.00100383	0.000299633	0.461314	128.547	136.919	0.156012	1	
1983	1	1	1	0	AGE	0	1	1	1	70									
1984	1	1	1	0	AGE	0	1	1	1	70	0	0.0942628	0.0522183	1.87796	98.739	58.403	5.49745	1	
1984	1	1	1	0	AGE	0	1	1	1	70	1	0.521349	0.604399	-1.6877	98.739	58.403	-7.60915	1	
1984	1	1	1	0	AGE	0	1	1	1	70	2	0.303139	0.279458	0.524394	98.739	58.403	2.43463	1	
1984	1	1	1	0	AGE	0	1	1	1	70	3	0.0624568	0.0486073	0.639952	98.739	58.403	1.54606	1	
1984	1	1	1	0	AGE	0	1	1	1	70	4	0.0163559	0.0117279	0.42715	98.739	58.403	0.537154	1	
1984	1	1	1	0	AGE	0	1	1	1	70	5	0.00196278	0.00266424	-0.135219	98.739	58.403	-0.0592174	1	
1984	1	1	1	0	AGE	0	1	1	1	70	6	0.000178356	0.000665488	-0.1877	98.739	58.403	-0.0231887	1	
1984	1	1	1	0	AGE	0	1	1	1	70	7	0.000296011	0.000260147	0.0220975	98.739	58.403	0.00377471	1	

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40 1982 L 1 71 1  
40 1982 L 1 72 1  
40 1982 L 1 73 1  
40 1982 L 1 74 1  
40 1982 L 1 75 1  
40 1982 L 1 76 1  
40 1982 L 1 77 1  
40 1982 L 1 78 1  
40 1982 L 1 79 1  
40 1982 A 1 0 0  
40 1982 A 1 1 0  
40 1982 A 1 2 0  
40 1982 A 1 3 0  
40 1982 A 1 4 1  
40 1982 A 1 5 1  
40 1982 A 1 6 1  
40 1982 A 1 7 1  
40 1982 A 1 8 1  
40 1982 A 1 9 1  
40 1982 A 1 10 1  
40 1982 A 1 11 1

40 1982 A 1 12 1  
40 1982 A 1 13 1  
40 1982 A 1 14 1  
40 1982 A 1 15 1  
40 2006 L 1 10 1  
40 2006 L 1 11 1  
40 2006 L 1 12 1  
40 2006 L 1 13 1  
40 2006 L 1 14 1  
40 2006 L 1 15 1  
40 2006 L 1 16 1  
40 2006 L 1 17 1  
40 2006 L 1 18 1  
40 2006 L 1 19 1  
40 2006 L 1 20 1  
40 2006 L 1 21 1  
40 2006 L 1 22 1  
40 2006 L 1 23 1  
40 2006 L 1 24 1  
40 2006 L 1 25 1  
40 2006 L 1 26 1  
40 2006 L 1 27 1  
40 2006 L 1 28 1  
40 2006 L 1 29 1  
40 2006 L 1 30 1  
40 2006 L 1 31 1  
40 2006 L 1 32 1  
40 2006 L 1 33 1  
40 2006 L 1 34 1  
40 2006 L 1 35 1  
40 2006 L 1 36 1  
40 2006 L 1 37 1  
40 2006 L 1 38 1  
40 2006 L 1 39 1  
40 2006 L 1 40 1  
40 2006 L 1 41 1  
40 2006 L 1 42 1  
40 2006 L 1 43 1  
40 2006 L 1 44 1  
40 2006 L 1 45 1  
40 2006 L 1 46 1  
40 2006 L 1 47 1  
40 2006 L 1 48 1  
40 2006 L 1 49 1  
40 2006 L 1 50 1  
40 2006 L 1 51 1  
40 2006 L 1 52 1  
40 2006 L 1 53 1  
40 2006 L 1 54 1  
40 2006 L 1 55 1  
40 2006 L 1 56 1  
40 2006 L 1 57 1  
40 2006 L 1 58 1  
40 2006 L 1 59 1  
40 2006 L 1 60 1  
40 2006 L 1 61 1  
40 2006 L 1 62 1

40 2006 L 1 63 1  
40 2006 L 1 64 1  
40 2006 L 1 65 1  
40 2006 L 1 66 1  
40 2006 L 1 67 1  
40 2006 L 1 68 1  
40 2006 L 1 69 1  
40 2006 L 1 70 1  
40 2006 L 1 71 1  
40 2006 L 1 72 1  
40 2006 L 1 73 1  
40 2006 L 1 74 1  
40 2006 L 1 75 1  
40 2006 L 1 76 1  
40 2006 L 1 77 1  
40 2006 L 1 78 1  
40 2006 L 1 79 1

**ASAP ALTERNATIVE RUN (F08 MULTI.REP)**

Age Structured Assessment Program (ASAP) Version 2.0  
Start time for run: Fri Mar 28 14:03:48 2008

obj\_fun = 15241

Component	Lambda	obj_fun
__Catch_Fleet_1	10	1877.04
__Catch_Fleet_2	10	1544.39
__Catch_Fleet_3	10	1939.13
__Catch_Fleet_4	10	739.297
__Catch_Fleet_5	10	1782.98
__Catch_Fleet_6	10	1211.04
Catch_Fleet_Total	60	9093.88
Discard_Fleet_Total	0	0
__Index_Fit_1	1	66.6243
__Index_Fit_2	1	80.0002
__Index_Fit_3	1	67.5598
__Index_Fit_4	1	51.4012
__Index_Fit_5	1	-0.0202589
__Index_Fit_6	1	153.535
__Index_Fit_7	1	239.541
__Index_Fit_8	1	200.97
__Index_Fit_9	1	196.886
__Index_Fit_10	1	-16.6202
__Index_Fit_11	1	86.1327
__Index_Fit_12	1	91.1568
__Index_Fit_13	1	52.1087
__Index_Fit_14	1	150.254
__Index_Fit_15	1	99.362
__Index_Fit_16	1	134.953
__Index_Fit_17	1	122.561
__Index_Fit_18	1	2.24523
__Index_Fit_19	1	8.671
__Index_Fit_20	1	28.7793
__Index_Fit_21	1	47.6055
__Index_Fit_22	1	16.6357
__Index_Fit_23	1	16.9894
__Index_Fit_24	1	-51.5095
__Index_Fit_25	1	135.333
__Index_Fit_26	1	103.877
__Index_Fit_27	1	4.76758
__Index_Fit_28	1	18.3802
__Index_Fit_29	1	51.2794
__Index_Fit_30	1	35.4177
__Index_Fit_31	1	2.77264
__Index_Fit_32	1	-2.8089
__Index_Fit_33	1	-8.864
__Index_Fit_34	1	22.0102
__Index_Fit_35	1	84.0859
__Index_Fit_36	1	29.798
__Index_Fit_37	1	-1.6381
__Index_Fit_38	1	10.6022
__Index_Fit_39	1	-26.1076
Index_Fit_Total	39	2304.73

Catch_Age_Comps	see_below	2969.88
Discard_Age_Comps	see_below	0
Survey_Age_Comps	see_below	0
__Sel_Param_1	1	0.936118
__Sel_Param_2	1	9.50888
__Sel_Param_3	1	1.07152
__Sel_Param_4	1	3.29308
__Sel_Param_5	0	0
__Sel_Param_6	0	0
__Sel_Param_7	0	0
__Sel_Param_8	0	0
__Sel_Param_9	1	31.9103
__Sel_Param_11	1	27.3277
__Sel_Param_12	1	36.5316
__Sel_Param_13	1	127.817
__Sel_Param_17	1	43.6811
__Sel_Param_18	1	52.9685
__Sel_Param_20	1	32.7438
__Sel_Param_21	1	127.076
__Sel_Param_25	1	5.63047
__Sel_Param_26	1	6.40689
__Sel_Param_27	1	0.964431
__Sel_Param_28	1	2.43487
__Sel_Param_29	1	0.983463
__Sel_Param_30	1	6.26073
__Sel_Param_31	1	1.87898
__Sel_Param_32	1	0.471283
__Sel_Param_33	1	0.862186
__Sel_Param_34	1	3.08129
__Sel_Param_35	1	1.69466
__Sel_Param_36	1	0.45685
Sel_Params_Total	24	525.991
Index_Sel_Params_Total	0	0
q_year1_Total	0	0
q_devs_Total	390000	0
__Fmult_year1_fleet_1	1	-0.0337486
__Fmult_year1_fleet_2	1	-0.947953
__Fmult_year1_fleet_3	1	119.098
__Fmult_year1_fleet_4	1	119.098
__Fmult_year1_fleet_5	1	-0.912333
__Fmult_year1_fleet_6	1	-2.32929
Fmult_year1_fleet_Total	6	233.973
Fmult_devs_fleet_Total	0	0
N_year_1	1	112.517
Recruit_devs	0	0
SRR_steepness	0	0
SRR_unexpl_stock	0	0
Fmult_Max_penalty	1000	0
F_penalty	0	0

Input and Estimated effective sample sizes for fleet 1

1982	31	0.147417
1983	33	0.898701
1984	43	5.6284
1985	379	28.2572
1986	39	1.61224
1987	46	1.9825

1988	663	6.13933
1989	92	0.268166
1990	2270	14.4763
1991	58	5.38301
1992	173	36.1143
1993	415	0.543977
1994	106	27.0134
1995	75	5.5447
1996	222	74.3296
1997	267	29.7625
1998	151	34.9819
1999	187	35.1401
2000	125	220.538
2001	215	64.1492
2002	61	54.2717
2003	236	190.693
2004	139	198.832
2005	368	108.406
2006	194	137.673
Total	6588	1282.79

Input and Estimated effective sample sizes for fleet 2

1982	10	0.712283
1983	10	3.03629
1984	10	6.36126
1985	10	16.0141
1986	10	3.56065
1987	10	4.11491
1988	10	4.53438
1989	10	0.274052
1990	10	1.73521
1991	10	1.26817
1992	10	1.42726
1993	10	0.346909
1994	10	1.9512
1995	10	14.0067
1996	10	492.898
1997	10	52.9347
1998	10	3.472
1999	10	57.4301
2000	10	11.5192
2001	10	98.716
2002	10	17.431
2003	10	35.0355
2004	10	121.414
2005	10	73.0833
2006	10	21.8506
Total	250	1045.13

Input and Estimated effective sample sizes for fleet 3

1982	0	0.465551
1983	0	0.0121706
1984	0	0.0209155
1985	0	0.074156
1986	0	0.0108732
1987	0	0.0129946
1988	0	0.156564
1989	10	0.0196182
1990	10	0.15668

1991	10	0.319361
1992	10	0.105662
1993	10	0.00947753
1994	10	0.187696
1995	10	0.0592449
1996	10	0.145677
1997	10	0.0946546
1998	10	0.0745172
1999	10	0.0840536
2000	10	0.0706801
2001	10	0.0532664
2002	10	0.0806595
2003	10	0.142673
2004	10	0.11657
2005	10	0.0653514
2006	10	0.134733

Total 180 2.6738

Input and Estimated effective sample sizes for fleet 4

1982	0	0.686486
1983	0	1.21655
1984	0	0.0572049
1985	0	0.030537
1986	0	0.205963
1987	0	0.0968318
1988	0	0.0207169
1989	0	0.661225
1990	0	0.0322526
1991	0	0.0945405
1992	0	0.0561221
1993	0	0.602836
1994	10	0.0372712
1995	10	0.273627
1996	10	0.0435081
1997	10	0.170818
1998	10	0.119031
1999	10	0.160654
2000	10	0.146684
2001	10	0.0809365
2002	10	0.147593
2003	10	0.176547
2004	10	0.358269
2005	10	0.525562
2006	10	0.36881

Total 130 6.37058

Input and Estimated effective sample sizes for fleet 5

1982	10	0.175635
1983	10	1.07349
1984	10	11.7974
1985	10	0.984143
1986	10	0.835117
1987	10	11.3206
1988	10	0.419009
1989	10	1.0212
1990	10	1.15092
1991	10	1.93541
1992	10	0.220628
1993	10	1.35793

1994	10	1.89303
1995	10	14.9871
1996	10	149.609
1997	10	124.659
1998	10	41.583
1999	10	12.8314
2000	10	33.1151
2001	10	81.1593
2002	10	18.3198
2003	10	26.2859
2004	10	33.2905
2005	10	25.1711
2006	10	16.5029

Total 250 611.699

Input and Estimated effective sample sizes for fleet 6

1982	10	0.489658
1983	10	104.521
1984	10	6.07525
1985	10	2.28558
1986	10	14.9846
1987	10	10.7144
1988	10	1.01669
1989	10	32.2254
1990	10	3.54807
1991	10	4.52461
1992	10	1.67619
1993	10	21.4085
1994	10	3.55157
1995	10	6.61065
1996	10	2.5926
1997	10	23.9414
1998	10	17.7821
1999	10	6.75535
2000	10	11.8739
2001	10	96.8511
2002	10	69.6861
2003	10	749.762
2004	10	72.6829
2005	10	42.7866
2006	10	1495.42

Total 250 2803.77

Input and Estimated effective Discard sample sizes for fleet 1

1982	0	1e+15
1983	0	1e+15
1984	0	1e+15
1985	0	1e+15
1986	0	1e+15
1987	0	1e+15
1988	0	1e+15
1989	0	1e+15
1990	0	1e+15
1991	0	1e+15
1992	0	1e+15
1993	0	1e+15
1994	0	1e+15
1995	0	1e+15



1996 0 1e+15  
1997 0 1e+15  
1998 0 1e+15  
1999 0 1e+15  
2000 0 1e+15  
2001 0 1e+15  
2002 0 1e+15  
2003 0 1e+15  
2004 0 1e+15  
2005 0 1e+15  
2006 0 1e+15

Total 0 2.5e+16

Input and Estimated effective Discard sample sizes for fleet 2

1982 0 1e+15  
1983 0 1e+15  
1984 0 1e+15  
1985 0 1e+15  
1986 0 1e+15  
1987 0 1e+15  
1988 0 1e+15  
1989 0 1e+15  
1990 0 1e+15  
1991 0 1e+15  
1992 0 1e+15  
1993 0 1e+15  
1994 0 1e+15  
1995 0 1e+15  
1996 0 1e+15  
1997 0 1e+15  
1998 0 1e+15  
1999 0 1e+15  
2000 0 1e+15  
2001 0 1e+15  
2002 0 1e+15  
2003 0 1e+15  
2004 0 1e+15  
2005 0 1e+15  
2006 0 1e+15

Total 0 2.5e+16

Input and Estimated effective Discard sample sizes for fleet 3

1982 0 1e+15  
1983 0 1e+15  
1984 0 1e+15  
1985 0 1e+15  
1986 0 1e+15  
1987 0 1e+15  
1988 0 1e+15  
1989 0 1e+15  
1990 0 1e+15  
1991 0 1e+15  
1992 0 1e+15  
1993 0 1e+15  
1994 0 1e+15  
1995 0 1e+15  
1996 0 1e+15  
1997 0 1e+15  
1998 0 1e+15

1999 0 1e+15  
2000 0 1e+15  
2001 0 1e+15  
2002 0 1e+15  
2003 0 1e+15  
2004 0 1e+15  
2005 0 1e+15  
2006 0 1e+15

Total 0 2.5e+16

Input and Estimated effective Discard sample sizes for fleet 4

1982 0 1e+15  
1983 0 1e+15  
1984 0 1e+15  
1985 0 1e+15  
1986 0 1e+15  
1987 0 1e+15  
1988 0 1e+15  
1989 0 1e+15  
1990 0 1e+15  
1991 0 1e+15  
1992 0 1e+15  
1993 0 1e+15  
1994 0 1e+15  
1995 0 1e+15  
1996 0 1e+15  
1997 0 1e+15  
1998 0 1e+15  
1999 0 1e+15  
2000 0 1e+15  
2001 0 1e+15  
2002 0 1e+15  
2003 0 1e+15  
2004 0 1e+15  
2005 0 1e+15  
2006 0 1e+15

Total 0 2.5e+16

Input and Estimated effective Discard sample sizes for fleet 5

1982 0 1e+15  
1983 0 1e+15  
1984 0 1e+15  
1985 0 1e+15  
1986 0 1e+15  
1987 0 1e+15  
1988 0 1e+15  
1989 0 1e+15  
1990 0 1e+15  
1991 0 1e+15  
1992 0 1e+15  
1993 0 1e+15  
1994 0 1e+15  
1995 0 1e+15  
1996 0 1e+15  
1997 0 1e+15  
1998 0 1e+15  
1999 0 1e+15  
2000 0 1e+15  
2001 0 1e+15

2002	0	1e+15
2003	0	1e+15
2004	0	1e+15
2005	0	1e+15
2006	0	1e+15
Total	0	2.5e+16

Input and Estimated effective Discard sample sizes for fleet 6

1982	0	1e+15
1983	0	1e+15
1984	0	1e+15
1985	0	1e+15
1986	0	1e+15
1987	0	1e+15
1988	0	1e+15
1989	0	1e+15
1990	0	1e+15
1991	0	1e+15
1992	0	1e+15
1993	0	1e+15
1994	0	1e+15
1995	0	1e+15
1996	0	1e+15
1997	0	1e+15
1998	0	1e+15
1999	0	1e+15
2000	0	1e+15
2001	0	1e+15
2002	0	1e+15
2003	0	1e+15
2004	0	1e+15
2005	0	1e+15
2006	0	1e+15
Total	0	2.5e+16

Observed and predicted total fleet catch by year and standardized residual  
fleet 1 total catches

1982	7536	6808.31	1.018
1983	10201	8780.13	1.50368
1984	11455	11409.2	0.0401375
1985	10767	11248.1	-0.438256
1986	9500	9556.78	-0.0597368
1987	9945	9795.27	0.152079
1988	11616	8659.4	2.94471
1989	6218	6391.27	-0.275538
1990	2962	3195.09	-0.759405
1991	4629	4805.83	-0.375827
1992	6361	6431.46	-0.110439
1993	4401	4267.02	0.30994
1994	4969	4949	0.0404371
1995	4911	4946.34	-0.0718918
1996	3947	3887.15	0.153165
1997	3313	3298.67	0.0434524
1998	3730	3688.7	0.11163
1999	3551	3505.36	0.129687
2000	3564	3538.21	0.0728044
2001	3705	3681.62	0.0634488
2002	4723	4710.29	0.0270092

2003	4835	4837.98	-0.0061673
2004	6036	6030.34	0.00940711
2005	5984	5946.27	0.0634089
2006	4481	4479.84	0.00258531

fleet 2 total catches

1982	2864	2756.09	0.385008
1983	3201	3062.1	0.444739
1984	5674	5666.49	0.0132711
1985	3907	3960.58	-0.136546
1986	2687	2690.51	-0.0130697
1987	2326	2318.15	0.0339056
1988	3071	2810.69	0.887935
1989	1908	1932.72	-0.129074
1990	1237	1271.82	-0.278293
1991	1595	1613.29	-0.114287
1992	1168	1169.96	-0.0167759
1993	1313	1300.87	0.0930692
1994	1620	1618.14	0.0115446
1995	2066	2077.57	-0.0559815
1996	1913	1891.75	0.111965
1997	681	680.057	0.013885
1998	1346	1341.01	0.0372674
1999	1271	1265.3	0.0450859
2000	1521	1516.72	0.0282323
2001	1265	1262.73	0.0180238
2002	1850	1847.32	0.014526
2003	1614	1614.25	-0.0015759
2004	2193	2190.99	0.00917416
2005	1841	1837.65	0.0182392
2006	1781	1780.86	0.000765442

fleet 3 total catches

1982	0	1.40667e-05	-8.80433
1983	0	1.47689e-09	-0.00148046
1984	0	6.96215e-16	-6.97961e-10
1985	0	7.38186e-23	0
1986	0	4.60965e-16	-4.62114e-10
1987	0	4.43437e-10	-0.000444533
1988	0	2.02826e-05	-11.1075
1989	709	343.032	7.27843
1990	1214	1227.14	-0.107945
1991	1052	1038.78	0.126742
1992	690	697.592	-0.109703
1993	846	838.904	0.0844358
1994	434	433.774	0.00522764
1995	138	138.032	-0.00234467
1996	355	355.288	-0.00813577
1997	239	238.914	0.00360223
1998	254	253.854	0.00574547
1999	1181	1176.88	0.0350503
2000	592	591.107	0.0151337
2001	230	229.99	0.000455151
2002	307	306.853	0.00481126
2003	445	445.314	-0.00707772
2004	170	170.006	-0.000331974
2005	153	153.004	-0.000237102
2006	214	214.006	-0.00030281

fleet 4 total catches

1982	0	1.03116e-05	-7.10375
1983	0	5.16666e-10	-0.00051794
1984	0	3.2367e-15	-3.24477e-09
1985	0	2.22793e-19	-2.31502e-13
1986	0	4.26525e-23	0
1987	0	7.94291e-17	-7.96367e-11
1988	0	1.13948e-19	-1.24655e-13
1989	0	1.9091e-24	0
1990	0	1.06716e-20	-1.78078e-14
1991	0	9.79708e-16	-9.82156e-10
1992	0	1.2577e-11	-1.26083e-05
1993	0	1.00546e-05	-6.9761
1994	472	333.056	3.49538
1995	170	169.807	0.0113972
1996	108	108.009	-0.000879486
1997	86	86.0074	-0.0008571
1998	135	134.911	0.00664133
1999	367	366.362	0.017434
2000	134	133.944	0.00415458
2001	238	237.756	0.0102942
2002	142	142.026	-0.00184111
2003	83	82.9992	9.1354e-05
2004	74	74.0098	-0.0013227
2005	77	76.9847	0.00199767
2006	74	73.9997	3.75302e-05

fleet 5 total catches

1982	8267	7849.96	0.518921
1983	12687	11645.9	0.858355
1984	8512	8505.84	0.00726035
1985	5665	5727.57	-0.110116
1986	8102	8106.96	-0.00614051
1987	5519	5494.02	0.045485
1988	6634	6091.35	0.855509
1989	1435	1445.04	-0.0699211
1990	2329	2404.04	-0.317924
1991	3611	3704.07	-0.255098
1992	3242	3233.12	0.0274908
1993	4006	3926.26	0.201564
1994	4231	4230.83	0.00039813
1995	2459	2466.04	-0.0286794
1996	4454	4404.8	0.111347
1997	5382	5348.39	0.0627967
1998	5659	5564.69	0.168474
1999	3795	3743.22	0.137728
2000	7470	7353.87	0.157069
2001	5279	5231.99	0.0896783
2002	3632	3624.77	0.0199651
2003	5279	5284.45	-0.0103434
2004	4831	4829.44	0.00323729
2005	4724	4701.11	0.0486843
2006	4992	4990.71	0.00259726

fleet 6 total catches

1982	296	292.638	0.114522
1983	376	374.429	0.0419676
1984	415	415.391	-0.00942972
1985	92	92.0251	-0.00273715
1986	578	577.949	0.000880506

1987	522	521.61	0.00748324
1988	341	336.182	0.142656
1989	45	45.0274	-0.00609459
1990	234	235.446	-0.0617614
1991	429	429.566	-0.0132188
1992	344	344.109	-0.00317179
1993	910	903.223	0.0749427
1994	687	686.749	0.0036706
1995	752	752.206	-0.00275198
1996	681	681.467	-0.00687548
1997	556	555.933	0.00120232
1998	734	732.367	0.0223255
1999	711	709.099	0.0268445
2000	952	949.437	0.027028
2001	1274	1270.68	0.0261641
2002	777	776.799	0.00259448
2003	882	882.647	-0.00735179
2004	1034	1035.26	-0.0122511
2005	999	998.253	0.00749436
2006	795	794.89	0.00139047

Observed and predicted total fleet Discards by year and standardized residual  
 fleet 1 total Discards

1982	0	0	0
1983	0	0	0
1984	0	0	0
1985	0	0	0
1986	0	0	0
1987	0	0	0
1988	0	0	0
1989	0	0	0
1990	0	0	0
1991	0	0	0
1992	0	0	0
1993	0	0	0
1994	0	0	0
1995	0	0	0
1996	0	0	0
1997	0	0	0
1998	0	0	0
1999	0	0	0
2000	0	0	0
2001	0	0	0
2002	0	0	0
2003	0	0	0
2004	0	0	0
2005	0	0	0
2006	0	0	0

fleet 2 total Discards

1982	0	0	0
1983	0	0	0
1984	0	0	0
1985	0	0	0
1986	0	0	0
1987	0	0	0
1988	0	0	0
1989	0	0	0
1990	0	0	0

1991	0	0	0
1992	0	0	0
1993	0	0	0
1994	0	0	0
1995	0	0	0
1996	0	0	0
1997	0	0	0
1998	0	0	0
1999	0	0	0
2000	0	0	0
2001	0	0	0
2002	0	0	0
2003	0	0	0
2004	0	0	0
2005	0	0	0
2006	0	0	0

fleet 3 total Discards

1982	0	0	0
1983	0	0	0
1984	0	0	0
1985	0	0	0
1986	0	0	0
1987	0	0	0
1988	0	0	0
1989	0	0	0
1990	0	0	0
1991	0	0	0
1992	0	0	0
1993	0	0	0
1994	0	0	0
1995	0	0	0
1996	0	0	0
1997	0	0	0
1998	0	0	0
1999	0	0	0
2000	0	0	0
2001	0	0	0
2002	0	0	0
2003	0	0	0
2004	0	0	0
2005	0	0	0
2006	0	0	0

fleet 4 total Discards

1982	0	0	0
1983	0	0	0
1984	0	0	0
1985	0	0	0
1986	0	0	0
1987	0	0	0
1988	0	0	0
1989	0	0	0
1990	0	0	0
1991	0	0	0
1992	0	0	0
1993	0	0	0
1994	0	0	0
1995	0	0	0

1996	0	0	0
1997	0	0	0
1998	0	0	0
1999	0	0	0
2000	0	0	0
2001	0	0	0
2002	0	0	0
2003	0	0	0
2004	0	0	0
2005	0	0	0
2006	0	0	0

fleet 5 total Discards

1982	0	0	0
1983	0	0	0
1984	0	0	0
1985	0	0	0
1986	0	0	0
1987	0	0	0
1988	0	0	0
1989	0	0	0
1990	0	0	0
1991	0	0	0
1992	0	0	0
1993	0	0	0
1994	0	0	0
1995	0	0	0
1996	0	0	0
1997	0	0	0
1998	0	0	0
1999	0	0	0
2000	0	0	0
2001	0	0	0
2002	0	0	0
2003	0	0	0
2004	0	0	0
2005	0	0	0
2006	0	0	0

fleet 6 total Discards

1982	0	0	0
1983	0	0	0
1984	0	0	0
1985	0	0	0
1986	0	0	0
1987	0	0	0
1988	0	0	0
1989	0	0	0
1990	0	0	0
1991	0	0	0
1992	0	0	0
1993	0	0	0
1994	0	0	0
1995	0	0	0
1996	0	0	0
1997	0	0	0
1998	0	0	0
1999	0	0	0
2000	0	0	0



2001 0 0 0  
 2002 0 0 0  
 2003 0 0 0  
 2004 0 0 0  
 2005 0 0 0  
 2006 0 0 0

Index data

index number 1

units = 2

month = 1

starting and ending ages for selectivity = 2 2

selectivity choice = -1

year, obs index, pred index, standardized residual

1992	7.15	1.7176	4.85822
1993	6.5	5.96706	0.291415
1994	3.76	3.53126	0.213805
1995	6.07	4.17676	1.27341
1996	22.17	5.43429	4.78951
1997	3.86	3.8345	0.0225808
1998	1.68	3.68081	-2.67181
1999	2.11	4.5485	-2.61653
2000	0.7	3.40354	-5.38728
2001	3.07	4.10199	-0.987175
2002	2.77	3.74054	-1.02324
2003	8.17	3.99914	2.43354
2004	1.45	2.37909	-1.68672
2005	2.96	3.76141	-0.816199
2006	2.64	1.79904	1.30647

index number 2

units = 2

month = 1

starting and ending ages for selectivity = 3 3

selectivity choice = -1

year, obs index, pred index, standardized residual

1992	4.74	2.38615	2.33804
1993	6.7	0.521387	8.69794
1994	7.2	7.41539	-0.100412
1995	4.59	4.58809	0.00142151
1996	8.33	9.25007	-0.356887
1997	4.8	11.9637	-3.11099
1998	3.25	8.86642	-3.41877
1999	4.8	8.50088	-1.94697
2000	6.52	9.73104	-1.3641
2001	5.33	7.56103	-1.19109
2002	10.74	9.72665	0.3376
2003	14.36	9.10086	1.55361
2004	8.68	9.5817	-0.336673
2005	4.03	5.6944	-1.17767
2006	9.06	8.86279	0.0749661

index number 3

units = 2

month = 1

starting and ending ages for selectivity = 4 4

selectivity choice = -1

year, obs index, pred index, standardized residual

1992	0.33	0.589386	-1.9757
------	------	----------	---------

```

1993  0.31  0.221784  1.14071
1994  0.82  0.162039  5.52345
1995  0.25  2.22421  -7.44548
1996  0.6   0.96853  -1.63118
1997  1.04  2.27324  -2.66379
1998  2.29  4.17855  -2.04869
1999  2.9   3.11713  -0.245953
2000  4.96  3.33931  1.34773
2001  6.42  3.60312  1.96763
2002  5.58  3.08997  2.01331
2003  8.48  4.32702  2.29197
2004  4.56  4.07383  0.38404
2005  3.07  4.04302  -0.937842
2006  4.29  2.19686  2.27979
index number 4
units = 2
month = 1
starting and ending ages for selectivity = 5 5
selectivity choice = -1
  year, obs index, pred index, standardized residual
1992  0.04  0.314245  -7.0217
1993  0.05  0.0582018  -0.517419
1994  0.26  0.0727777  4.33734
1995  0.02  0.0540931  -3.38933
1996  0.12  0.325862  -3.40299
1997  0.43  0.172074  3.11984
1998  0.42  0.696821  -1.7246
1999  0.84  1.29958  -1.48656
2000  2.51  1.17806  2.5767
2001  2.44  1.13166  2.61723
2002  2.26  1.42667  1.56704
2003  2.67  1.29098  2.47539
2004  1.64  1.83843  -0.389071
2005  1.34  1.60086  -0.605915
2006  2.47  1.43747  1.84404
index number 5
units = 2
month = 1
starting and ending ages for selectivity = 6 8
selectivity choice = -1
  year, obs index, pred index, standardized residual
1992  0.04  0.0364937  0.312509
1993  0.04  0.0528952  -0.951876
1994  0.01  0.0514255  -5.57823
1996  0.03  0.0221543  1.03273
1997  0.15  0.090818  1.70928
1998  0.12  0.113978  0.175374
1999  0.41  0.372351  0.328108
2000  1.08  0.922711  0.536175
2001  1.34  0.995307  1.01299
2002  1.33  1.18012  0.407287
2003  1.96  1.51704  0.872671
2004  1.44  1.63542  -0.433492
2005  1.49  1.90465  -0.836351
2006  2.6   1.71731  1.41283
index number 6
units = 2

```

```

month = 1
starting and ending ages for selectivity = 2 2
selectivity choice = -1
year, obs index, pred index, standardized residual
1982 0.7 0.00284095 14.2943
1983 0.32 1.2295 -3.49392
1984 0.17 1.23459 -5.14648
1985 0.55 0.348088 1.18744
1986 1.48 0.721365 1.8654
1987 0.47 0.955739 -1.8423
1988 0.6 0.136305 3.84692
1989 0.06 0.574106 -5.8623
1990 0.63 0.323374 1.7311
1991 0.79 0.407191 1.7203
1992 0.77 0.210314 3.36866
1993 0.73 0.730644 -0.00228805
1994 0.35 0.432389 -0.548711
1995 0.79 0.511428 1.12868
1996 1.08 0.665408 1.25714
1997 0.29 0.46952 -1.25068
1998 0.27 0.450701 -1.32999
1999 0.22 0.556946 -2.41099
2000 0.19 0.416751 -2.03883
2001 0.48 0.502273 -0.117737
2002 0.34 0.458014 -0.773401
2003 0.54 0.489679 0.253907
2004 0.3 0.29131 0.0762957
2005 0.26 0.46057 -1.48418
2006 0.04 0.220285 -4.42837

```

index number 7

units = 2

month = 1

starting and ending ages for selectivity = 3 3

selectivity choice = -1

```

year, obs index, pred index, standardized residual
1982 1.43 0.00572953 14.3277
1983 0.39 0.00376573 12.0446
1984 0.33 1.64693 -4.17278
1985 1.56 1.5154 0.0752948
1986 0.43 0.318085 0.782516
1987 0.43 0.754771 -1.46041
1988 0.81 1.25758 -1.14186
1989 0.23 0.066575 3.21801
1990 0.03 0.693247 -8.15098
1991 0.27 0.449443 -1.32273
1992 0.41 0.376445 0.221634
1993 0.5 0.0822553 4.68466
1994 0.53 1.16987 -2.0552
1995 0.27 0.723827 -2.5597
1996 0.56 1.45931 -2.48612
1997 0.67 1.88743 -2.68834
1998 0.52 1.39879 -2.56852
1999 0.74 1.34112 -1.54343
2000 1.03 1.53519 -1.03593
2001 0.89 1.19285 -0.760219
2002 0.89 1.5345 -1.41397
2003 1.29 1.43577 -0.277899

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```

2004  1.45  1.51163  -0.108051
2005  0.65  0.898363  -0.839972
2006  1.04  1.39822  -0.768264
index number 8
units = 2
month = 1
starting and ending ages for selectivity = 4  4
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982  0.12  0.0147666  5.4383
1983  0.19  0.00152039  12.5322
1984  0.09  0.0010045  11.6685
1985  0.21  0.402015  -1.6856
1986  0.2  0.267596  -0.755766
1987  0.02  0.0654596  -3.07772
1988  0.07  0.197092  -2.68701
1989  0.02  0.116296  -4.56948
1990  0.06  0.0163915  3.36813
1992  0.01  0.104575  -6.09292
1993  0.04  0.0393511  0.0424538
1994  0.04  0.0287506  0.857157
1995  0.02  0.394642  -7.741
1996  0.12  0.171846  -0.932131
1997  0.09  0.40334  -3.89346
1998  0.32  0.7414  -2.18095
1999  0.48  0.553072  -0.367813
2000  0.63  0.592493  0.159324
2001  1.02  0.6393  1.21267
2002  0.74  0.548252  0.77849
2003  0.59  0.767742  -0.683527
2004  0.85  0.722819  0.420705
2005  0.58  0.717351  -0.551682
2006  0.24  0.389789  -1.25883
index number 9
units = 2
month = 1
starting and ending ages for selectivity = 5  5
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982  0.02  0.81385  -9.61976
1983  0.03  0.00427795  5.0557
1984  0.05  0.000438595  12.2937
1985  0.04  0.000265065  13.0217
1986  0.02  0.0764775  -3.48152
1987  0.01  0.0599833  -4.65014
1988  0.02  0.0185425  0.196414
1989  0.01  0.0199184  -1.78859
1991  0.02  0.00657355  2.88817
1994  0.01  0.0151058  -1.0707
1997  0.01  0.0357157  -3.30433
1998  0.06  0.144632  -2.28382
1999  0.13  0.269742  -1.89468
2000  0.12  0.244518  -1.84761
2001  0.2  0.234887  -0.417352
2002  0.31  0.296121  0.118896
2003  0.29  0.267956  0.20521
2004  0.27  0.381585  -0.897883

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2005  0.15  0.332275  -2.06443
2006  0.25  0.298361  -0.459031
index number 10
units = 2
month = 1
starting and ending ages for selectivity = 6  8
selectivity choice = -1
  year, obs index, pred index, standardized residual
1983  0.02  0.172594  -5.59427
1984  0.02  0.0538135  -2.5692
1985  0.02  0.0151936  0.713452
1986  0.01  0.00309704  3.04251
1992  0.01  0.00420913  2.24613
1995  0.01  0.0068009  1.00072
1998  0.02  0.0131461  1.08917
1999  0.03  0.0429465  -0.931226
2000  0.17  0.106424  1.21573
2001  0.1  0.114797  -0.358202
2002  0.19  0.136113  0.865757
2003  0.2  0.174974  0.346997
2004  0.16  0.188627  -0.427247
2005  0.17  0.219679  -0.665459
2006  0.2  0.198072  0.0251384
index number 11
units = 2
month = 1
starting and ending ages for selectivity = 3  3
selectivity choice = -1
  year, obs index, pred index, standardized residual
1983  1.52  0.00558967  10.109
1984  1.46  2.44463  -0.929565
1985  1.39  2.24938  -0.868062
1986  0.8  0.47215  0.950953
1987  0.83  1.12034  -0.540953
1988  0.58  1.86668  -2.10796
1989  0.62  0.0988206  3.31176
1990  0.21  1.02902  -2.86604
1991  0.38  0.667131  -1.01497
1992  0.84  0.558776  0.735154
1993  1.04  0.122096  3.86316
1994  0.8  1.7365  -1.39765
1995  0.67  1.07441  -0.851653
1996  1.16  2.16613  -1.12626
1997  1.24  2.80161  -1.4699
1998  1.29  2.07629  -0.858304
1999  2.13  1.99069  0.12198
2000  1.73  2.27876  -0.496853
2001  1.2  1.7706  -0.701514
2002  1.36  2.27773  -0.929999
2003  1.17  2.13119  -1.08145
2004  1.31  2.24379  -0.970474
2005  1.49  1.33349  0.200139
2006  1.14  2.07544  -1.08049
index number 12
units = 2
month = 1
starting and ending ages for selectivity = 4  4

```

```

selectivity choice = -1
  year, obs index, pred index, standardized residual
1983 0.4 0.0032314 8.68969
1984 0.34 0.00213494 9.14407
1985 0.43 0.854435 -1.2383
1986 0.46 0.568744 -0.382685
1987 0.11 0.139127 -0.423624
1988 0.2 0.418897 -1.33325
1989 0.18 0.247174 -0.571916
1990 0.05 0.0348382 0.651579
1991 0.03 0.543435 -5.22389
1992 0.09 0.222261 -1.63034
1993 0.25 0.0836361 1.97468
1994 0.03 0.0611059 -1.28295
1995 0.09 0.838764 -4.02537
1996 0.28 0.365238 -0.479268
1997 0.57 0.857251 -0.735952
1998 1.14 1.57576 -0.58377
1999 1.63 1.17549 0.58952
2000 1.49 1.25928 0.303401
2001 1.22 1.35876 -0.19426
2002 0.93 1.16524 -0.406666
2003 0.86 1.63174 -1.15502
2004 1.03 1.53627 -0.720985
2005 1.37 1.52465 -0.192874
2006 0.54 0.828451 -0.771827
index number 13
units = 2
month = 1
starting and ending ages for selectivity = 5 5
selectivity choice = -1
  year, obs index, pred index, standardized residual
1983 0.03 0.0097682 2.02351
1984 0.12 0.00100148 8.63102
1985 0.07 0.000605246 8.56719
1986 0.05 0.174627 -2.25537
1987 0.11 0.136965 -0.395381
1988 0.03 0.0423395 -0.621308
1989 0.03 0.0454813 -0.750396
1991 0.04 0.0150099 1.76762
1993 0.03 0.0275841 0.151405
1994 0.01 0.0344922 -2.23286
1995 0.01 0.0256368 -1.69779
1996 0.02 0.154439 -3.68624
1997 0.04 0.0815525 -1.28467
1998 0.29 0.330251 -0.23439
1999 0.33 0.615923 -1.12537
2000 0.31 0.558327 -1.06106
2001 0.4 0.536336 -0.528927
2002 0.37 0.676157 -1.0873
2003 0.35 0.611846 -1.00728
2004 0.25 0.871305 -2.25158
2005 0.66 0.758712 -0.25136
2006 0.47 0.681272 -0.669469
index number 14
units = 2
month = 1

```

```

starting and ending ages for selectivity = 3 3
selectivity choice = -1
year, obs index, pred index, standardized residual
1982 1.584 0.00621432 9.99228
1983 0.599 0.00408436 8.99545
1984 0.078 1.78628 -5.64673
1985 1.26 1.64362 -0.47932
1986 0.522 0.344999 0.746829
1987 0.64 0.818633 -0.443936
1988 1.005 1.36398 -0.55079
1989 0.363 0.072208 2.9122
1990 0.021 0.751904 -6.45266
1991 0.05 0.487472 -4.10668
1992 0.342 0.408297 -0.31953
1993 0.492 0.0892151 3.07915
1994 1.217 1.26886 -0.0752493
1995 1.302 0.785072 0.912299
1996 0.686 1.58279 -1.50775
1997 1.279 2.04713 -0.848239
1998 1.212 1.51714 -0.404961
1999 0.878 1.45459 -0.910413
2000 1.659 1.66509 -0.00660555
2001 1.026 1.29378 -0.4182
2002 1.511 1.66434 -0.174306
2003 1.44 1.55726 -0.141174
2004 0.283 1.63954 -3.16804
2005 0.351 0.974375 -1.84127
2006 2.44 1.51652 0.857651
index number 15
units = 2
month = 1
starting and ending ages for selectivity = 4 4
selectivity choice = -1
year, obs index, pred index, standardized residual
1982 0.142 0.0178219 3.74274
1983 0.45 0.00183496 9.92262
1984 0.067 0.00121233 7.23544
1985 0.036 0.485194 -4.69065
1986 0.185 0.322963 -1.00481
1987 0.013 0.0790035 -3.25428
1988 0.123 0.237872 -1.18942
1989 0.102 0.140358 -0.575688
1990 0.081 0.019783 2.5421
1991 0.012 0.308591 -5.85579
1992 0.09 0.126212 -0.609814
1993 0.065 0.047493 0.56591
1994 0.048 0.0346992 0.585171
1995 0.053 0.476295 -3.95977
1996 0.114 0.207402 -1.07925
1997 0.181 0.486793 -1.78416
1998 0.659 0.894799 -0.551611
1999 1.112 0.667505 0.920392
2000 1.205 0.715083 0.941071
2001 0.73 0.771575 -0.0998872
2002 0.397 0.661688 -0.921272
2003 0.624 0.926591 -0.71299
2004 0.323 0.872373 -1.79178

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```

2005  1.029  0.865775  0.311477
2006  0.975  0.470438  1.31426
index number 16
units = 2
month = 1
starting and ending ages for selectivity = 4  4
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982  0.405  0.0741221  3.06246
1983  1.662  0.00763169  9.70846
1984  0.625  0.00504215  8.69216
1985  0.267  2.01794  -3.6475
1986  1.895  1.34322  0.620636
1987  0.679  0.328579  1.30897
1988  0.663  0.98932  -0.721791
1989  0.429  0.583757  -0.555494
1990  0.317  0.0822783  2.43239
1992  0.288  0.52492  -1.08254
1993  0.186  0.197526  -0.108424
1994  0.478  0.144316  2.15975
1995  0.076  1.98093  -5.8801
1996  0.506  0.862593  -0.961937
1997  1.282  2.02459  -0.824053
1998  1.508  3.72151  -1.62908
1999  0.59  2.77618  -2.79292
2000  0.94  2.97406  -2.07715
2001  2.303  3.20902  -0.598275
2002  1.083  2.75199  -1.68182
2003  1.302  3.85374  -1.95693
2004  1.254  3.62824  -1.91593
2005  1.455  3.6008  -1.63414
2006  2.049  1.95657  0.0832379
index number 17
units = 2
month = 1
starting and ending ages for selectivity = 5  5
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982  0.012  1.25126  -8.38033
1983  0.02  0.00657719  2.00559
1984  0.154  0.000674324  9.79417
1985  0.127  0.000407528  10.3547
1986  0.04  0.117581  -1.9445
1987  0.214  0.0922221  1.51805
1988  0.011  0.0285083  -1.71737
1989  0.006  0.0306238  -2.93955
1990  0.016  0.0474074  -1.95882
1991  0.011  0.0101066  0.152759
1992  0.006  0.100281  -5.07872
1994  0.03  0.0232246  0.461643
1997  0.114  0.0549115  1.31733
1998  0.351  0.222367  0.823168
1999  0.262  0.414718  -0.828211
2000  0.379  0.375937  0.0146346
2001  0.494  0.36113  0.564997
2002  0.307  0.455275  -0.710629
2003  0.178  0.411973  -1.51335

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2004 0.256 0.586673 -1.49553
2005 0.136 0.510861 -2.38668
2006 1.35 0.458719 1.94661
index number 18
units = 2
month = 1
starting and ending ages for selectivity = 3 3
selectivity choice = -1
year, obs index, pred index, standardized residual
1984 0.271 0.497999 -1.09732
1985 0.325 0.458225 -0.619526
1986 0.1 0.0961823 0.0701957
1987 0.086 0.228227 -1.76009
1988 0.223 0.380265 -0.962459
1989 0.049 0.0201309 1.60423
1990 0.022 0.209624 -4.06532
1991 0.189 0.135902 0.594775
1992 0.188 0.113829 0.904835
1993 0.151 0.0248723 3.25245
1994 0.314 0.353745 -0.214932
1995 0.051 0.21887 -2.62691
1996 0.266 0.441266 -0.912787
1997 0.507 0.57072 -0.213497
1998 0.594 0.422964 0.612413
1999 0.593 0.405527 0.685299
2000 0.726 0.46421 0.806495
2001 0.34 0.360692 -0.106543
2002 1.264 0.464001 1.80726
2003 1.016 0.434148 1.53331
2004 0.818 0.457087 1.04955
2005 0.264 0.271646 -0.0514908
2006 0.36 0.422792 -0.28994
index number 19
units = 2
month = 1
starting and ending ages for selectivity = 4 4
selectivity choice = -1
year, obs index, pred index, standardized residual
1984 0.044 0.000395303 8.49807
1985 0.04 0.158206 -2.47969
1986 0.082 0.105308 -0.451149
1987 0.014 0.0257605 -1.09968
1988 0.035 0.0775623 -1.43501
1989 0.024 0.0457663 -1.16408
1990 0.013 0.00645059 1.26377
1991 0.029 0.100622 -2.24354
1992 0.021 0.0411535 -1.21329
1993 0.015 0.0154859 -0.0574964
1994 0.025 0.0113143 1.42974
1995 0.02 0.155304 -3.69631
1996 0.086 0.067627 0.433426
1997 0.057 0.158727 -1.84691
1998 0.503 0.291765 0.982198
1999 0.385 0.217652 1.02856
2000 0.524 0.233165 1.46028
2001 0.365 0.251586 0.671065
2002 0.465 0.215755 1.38481

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2003  0.395  0.302131  0.48335
2004  0.41  0.284453  0.6593
2005  0.15  0.282301  -1.14035
2006  0.068  0.153395  -1.46706
index number 20
units = 2
month = 1
starting and ending ages for selectivity = 5 5
selectivity choice = -1
  year, obs index, pred index, standardized residual
1985  0.058  0.00015053  10.7374
1986  0.008  0.0434313  -3.05086
1987  0.004  0.0340643  -3.86277
1988  0.009  0.0105302  -0.283173
1989  0.016  0.0113116  0.625342
1990  0.006  0.017511  -1.93155
1991  0.028  0.0037331  3.63376
1992  0.004  0.037041  -4.01385
1993  0.018  0.00686041  1.73955
1994  0.018  0.00857852  1.33651
1995  0.005  0.0063761  -0.438437
1996  0.023  0.0384103  -0.924831
1997  0.036  0.0202828  1.03468
1998  0.116  0.0821363  0.622547
1999  0.139  0.153185  -0.175244
2000  0.074  0.138861  -1.13506
2001  0.12  0.133391  -0.190791
2002  0.233  0.168166  0.58806
2003  0.232  0.152171  0.760541
2004  0.194  0.216701  -0.199563
2005  0.033  0.188698  -3.14445
2006  0.065  0.169438  -1.72782
index number 21
units = 2
month = 1
starting and ending ages for selectivity = 3 3
selectivity choice = -1
  year, obs index, pred index, standardized residual
1985  0.571  1.18195  -1.31202
1986  0.339  0.248094  0.563001
1987  1.17  0.588693  1.23866
1988  1.067  0.980861  0.1518
1989  0.884  0.051926  5.11194
1990  0.029  0.540707  -5.27595
1991  0.674  0.350549  1.17893
1992  0.826  0.293613  1.8653
1993  0.57  0.064156  3.93916
1994  0.827  0.912455  -0.177334
1995  0.3  0.564558  -1.14021
1996  0.384  1.13821  -1.9595
1997  0.887  1.47212  -0.913624
1998  0.681  1.091  -0.849915
1999  0.269  1.04602  -2.44907
2000  0.679  1.19739  -1.02302
2001  0.395  0.930376  -1.54496
2002  2.689  1.19685  1.45979
2003  3.087  1.11985  1.82864

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2004  1.459  1.17902  0.384248
2005  0.385  0.700689  -1.0799
2006  1.093  1.09056  0.0040374
index number 22
units = 2
month = 1
starting and ending ages for selectivity = 4  4
selectivity choice = -1
  year, obs index, pred index, standardized residual
1985  0.331  0.764198  -1.50891
1986  0.528  0.508679  0.0672297
1987  0.298  0.124434  1.57493
1988  0.223  0.374657  -0.935666
1989  0.481  0.22107  1.40193
1990  0.095  0.0311589  2.01037
1991  0.11  0.486043  -2.6795
1992  0.34  0.198788  0.967889
1993  0.366  0.0748033  2.86336
1994  0.152  0.0546525  1.84466
1995  0.085  0.750182  -3.92717
1996  0.117  0.326665  -1.85165
1997  1.188  0.766717  0.789718
1998  1.373  1.40934  -0.0471127
1999  1.054  1.05134  0.00454875
2000  1.484  1.12628  0.497407
2001  0.871  1.21526  -0.600654
2002  1.137  1.04218  0.157032
2003  1.93  1.45942  0.504017
2004  1.319  1.37402  -0.0736991
2005  0.755  1.36363  -1.06614
2006  0.744  0.740958  0.00738932
index number 23
units = 2
month = 1
starting and ending ages for selectivity = 5  5
selectivity choice = -1
  year, obs index, pred index, standardized residual
1985  0.072  0.000463814  9.09796
1986  0.075  0.133821  -1.04419
1987  0.072  0.104959  -0.67971
1988  0.033  0.0324458  0.0305435
1989  0.037  0.0348534  0.107781
1990  0.015  0.0539551  -2.30852
1991  0.042  0.0115025  2.33558
1992  0.036  0.114131  -2.0808
1993  0.046  0.0211384  1.40222
1994  0.039  0.0264322  0.701476
1995  0.024  0.0196461  0.36099
1996  0.012  0.11835  -4.12748
1997  0.042  0.0624957  -0.716714
1998  0.373  0.253079  0.699489
1999  0.321  0.471997  -0.695261
2000  0.346  0.42786  -0.38296
2001  0.341  0.411007  -0.336744
2002  0.436  0.518155  -0.311323
2003  0.479  0.468872  0.038538
2004  0.407  0.667702  -0.892727

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2005  0.44  0.581419  -0.502598
2006  0.355  0.522075  -0.695554
index number 24
units = 2
month = 1
starting and ending ages for selectivity = 6  8
selectivity choice = -1
  year, obs index, pred index, standardized residual
1985  0.025  0.0172014  0.67426
1986  0.009  0.00350631  1.69998
1987  0.007  0.0150196  -1.37679
1988  0.003  0.0185429  -3.28482
1989  0.003  0.00357342  -0.31543
1990  0.001  0.00532877  -3.01728
1991  0.012  0.012465  -0.0685657
1992  0.022  0.00476537  2.75858
1993  0.025  0.00690708  2.31974
1994  0.007  0.00671517  0.074915
1995  0.009  0.00769963  0.281422
1996  0.005  0.00289292  0.986763
1997  0.005  0.0118591  -1.5575
1998  0.04  0.0148834  1.78289
1999  0.075  0.0486218  0.781614
2000  0.127  0.120488  0.094922
2001  0.191  0.129968  0.69428
2002  0.134  0.154101  -0.252052
2003  0.183  0.198096  -0.142949
2004  0.203  0.213554  -0.091402
2005  0.119  0.24871  -1.32939
2006  0.151  0.224247  -0.713185
index number 25
units = 2
month = 1
starting and ending ages for selectivity = 4  4
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982  1.74  0.0469391  6.51525
1983  0.52  0.0048329  8.43692
1984  0.42  0.00319303  8.79922
1985  0.49  1.2779  -1.72866
1986  0.28  0.850616  -2.00387
1987  0.51  0.208079  1.61673
1988  0.37  0.626504  -0.949755
1989  0.24  0.369674  -0.779032
1990  0.07  0.0521041  0.532451
1991  0.12  0.812764  -3.44978
1992  0.08  0.332414  -2.56866
1993  0.41  0.125087  2.14089
1994  0.22  0.0913903  1.58425
1995  0.03  1.25446  -6.73251
1996  0.2  0.546252  -1.81197
1997  1.03  1.28211  -0.394846
1998  0.96  2.35671  -1.6196
1999  0.36  1.75807  -2.85992
2000  1.91  1.88338  0.0253137
2001  1.24  2.03216  -0.890853
2002  0.63  1.74274  -1.83494

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2003  1.38  2.44044  -1.0281
2004  2.08  2.29765  -0.179467
2005  1.3   2.28027  -1.01337
2006  1.38  1.23903  0.194317
index number 26
units = 2
month = 1
starting and ending ages for selectivity = 5 5
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982  0.2  1.61003  -3.76131
1983  0.07  0.00846304  3.81017
1984  0.11  0.000867669  8.73275
1985  0.1  0.000524377  9.46906
1986  0.02  0.151295  -3.64915
1987  0.13  0.118665  0.16453
1988  0.02  0.0366824  -1.09387
1992  0.01  0.129034  -4.61213
1993  0.11  0.0238985  2.75316
1994  0.07  0.0298836  1.53501
1997  0.01  0.070656  -3.52605
1998  0.03  0.286125  -4.06705
1999  0.09  0.533628  -3.20982
2000  0.35  0.483727  -0.583554
2001  0.45  0.464675  -0.0578707
2002  0.3  0.585813  -1.20686
2003  0.4  0.530095  -0.50782
2004  0.49  0.754887  -0.779356
2005  0.78  0.657338  0.308551
2006  0.69  0.590245  0.281605
index number 27
units = 2
month = 1
starting and ending ages for selectivity = 2 2
selectivity choice = -1
  year, obs index, pred index, standardized residual
1990  0.17  0.192384  -0.223068
1991  0.07  0.242248  -2.23884
1992  0.15  0.125121  0.327044
1993  0.11  0.434679  -2.47808
1994  0.08  0.25724  -2.10632
1995  0.2  0.304262  -0.75665
1996  0.41  0.395869  0.0632528
1997  0.17  0.27933  -0.89555
1998  0.07  0.268134  -2.42193
1999  0.26  0.331342  -0.437266
2000  0.63  0.247936  1.68174
2001  0.42  0.298816  0.613921
2002  0.81  0.272485  1.9647
2003  1.48  0.291323  2.93116
2004  0.54  0.173308  2.04954
2005  0.55  0.274005  1.25655
2006  0.19  0.131054  0.669808
index number 28
units = 2
month = 1
starting and ending ages for selectivity = 3 8

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selectivity choice = -1
  year, obs index, pred index, standardized residual
1990 0.1 0.330508 -2.15587
1991 0.08 0.214274 -1.77674
1992 0.18 0.179471 0.00530416
1993 0.14 0.0392155 2.29493
1994 0.05 0.55774 -4.34953
1995 0.22 0.345087 -0.811828
1996 0.53 0.695733 -0.49068
1997 0.52 0.899838 -0.98895
1998 0.36 0.666876 -1.11179
1999 0.61 0.639383 -0.0848404
2000 1.89 0.731908 1.71083
2001 0.55 0.568694 -0.0602757
2002 1.11 0.731577 0.751853
2003 2.25 0.68451 2.146
2004 1.53 0.720676 1.35765
2005 1.89 0.428298 2.67715
2006 1.09 0.666604 0.886791
index number 29
units = 2
month = 1
starting and ending ages for selectivity = 2 2
selectivity choice = -1
  year, obs index, pred index, standardized residual
1988 3.06 1.24591 1.62042
1989 0.51 5.2477 -4.20393
1990 1.44 2.95585 -1.29689
1991 2.69 3.72199 -0.585589
1992 3 1.92241 0.802566
1993 5.69 6.67856 -0.288889
1994 1.07 3.95232 -2.35638
1995 2.93 4.67479 -0.842508
1996 5.1 6.08226 -0.317641
1997 8.25 4.29172 1.17856
1998 5.8 4.1197 0.616896
1999 6.12 5.09085 0.332033
2000 3.91 3.80938 0.0470178
2001 3.32 4.59111 -0.584579
2002 9.11 4.18655 1.40212
2003 5.61 4.47599 0.407246
2004 6.27 2.66277 1.54444
2005 5.99 4.20991 0.635963
2006 5.74 2.01355 1.88915
index number 30
units = 2
month = 1
starting and ending ages for selectivity = 3 3
selectivity choice = -1
  year, obs index, pred index, standardized residual
1988 1.03 1.4517 -0.618874
1989 0.18 0.0768516 1.53483
1990 0.11 0.800258 -3.57873
1991 0.27 0.51882 -1.17785
1992 0.57 0.434553 0.489289
1993 0.2 0.0949523 1.34342
1994 0.08 1.35045 -5.09667

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1995  0.28  0.835558  -1.97166
1996  2.7   1.68458  0.850725
1997  5.25  2.17877  1.58601
1998  2.67  1.61471  0.906968
1999  3.46  1.54814  1.45031
2000  1.82  1.77217  0.0480312
2001  1.18  1.37698  -0.278398
2002  4.13  1.77137  1.52661
2003  2.55  1.6574  0.776975
2004  2.49  1.74497  0.641184
2005  1.24  1.03704  0.322346
2006  3.22  1.61405  1.24548
index number 31
units = 2
month = 1
starting and ending ages for selectivity = 4 4
selectivity choice = -1
  year, obs index, pred index, standardized residual
1990  0.03  0.0110983  1.7933
1991  0.02  0.17312  -3.89216
1992  0.06  0.0708049  -0.298611
1993  0.01  0.0266437  -1.76726
1995  0.05  0.267202  -3.02244
1996  0.18  0.116353  0.786872
1997  1.02  0.273092  2.37641
1998  0.29  0.501984  -0.989493
1999  0.65  0.374471  0.994489
2000  0.45  0.401163  0.207172
2001  0.41  0.432855  -0.0978247
2002  1.28  0.371208  2.23232
2003  0.57  0.519819  0.166191
2004  0.57  0.489403  0.274926
2005  0.53  0.485701  0.157406
2006  0.48  0.263917  1.0787
index number 32
units = 2
month = 1
starting and ending ages for selectivity = 5 8
selectivity choice = -1
  year, obs index, pred index, standardized residual
1992  0.02  0.0778932  -2.45189
1993  0.01  0.0144267  -0.660934
1994  0.02  0.0180397  0.186033
1995  0.16  0.0134083  4.47114
1996  0.05  0.0807727  -0.864931
1997  0.18  0.0426526  2.59664
1998  0.04  0.172724  -2.63802
1999  0.18  0.322132  -1.04958
2000  0.22  0.292009  -0.510643
2001  0.15  0.280508  -1.12886
2002  0.81  0.353635  1.49459
2003  0.51  0.32  0.840538
2004  0.43  0.455699  -0.104681
2005  0.32  0.396812  -0.387983
2006  0.4  0.35631  0.208584
index number 33
units = 2

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month = 1
starting and ending ages for selectivity = 1 1
selectivity choice = -1
year, obs index, pred index, standardized residual
1985 0.24 0.105105 1.48902
1986 0.172 0.146459 0.289887
1987 0.075 0.0205409 2.33551
1988 0.015 0.0938963 -3.30766
1990 0.032 0.0547498 -0.968484
1991 0.036 0.0338879 0.109033
1992 0.013 0.105233 -3.77128
1993 0.084 0.0607116 0.585527
1994 0.132 0.069827 1.14836
1995 0.023 0.0768581 -2.17572
1996 0.069 0.0542471 0.433816
1997 0.033 0.0519164 -0.817161
1999 0.044 0.0479008 -0.153185
2000 0.012 0.0579012 -2.83822
2001 0.021 0.0527185 -1.65991
2002 0.442 0.0561757 3.72007
2004 0.255 0.052937 2.83521
2005 0.067 0.025363 1.75181
2006 0.098 0.0564932 0.993388
index number 34

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units = 2
month = 1
starting and ending ages for selectivity = 1 1
selectivity choice = -1
year, obs index, pred index, standardized residual
1982 2.27 2.80526 -0.381808
1983 5.01 2.99392 0.928475
1984 1.58 0.838443 1.14269
1985 1.26 1.62622 -0.460128
1986 1.26 2.26607 -1.05847
1987 0.39 0.317815 0.369112
1988 0.54 1.45279 -1.78476
1989 1.24 0.649391 1.16649
1990 2.54 0.847106 1.98028
1991 2.64 0.524325 2.91503
1992 0.89 1.62819 -1.08925
1993 0.5 0.939349 -1.13718
1994 2.41 1.08039 1.44687
1995 0.63 1.18917 -1.14568
1996 0.81 0.839329 -0.0641447
1997 0.89 0.803267 0.184908
1998 0.73 0.992804 -0.55452
1999 0.53 0.741137 -0.604691
2000 0.57 0.895866 -0.815408
2001 0.47 0.815677 -0.994181
2002 0.77 0.869169 -0.218475
2003 0.44 0.517397 -0.292214
2004 1.3 0.819058 0.8331
2005 0.35 0.392425 -0.206327
2006 0.8 0.874082 -0.159712
index number 35
units = 2
month = 1

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starting and ending ages for selectivity = 1 1
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982 3.408 23.7576 -3.50177
1983 17.699 25.3553 -0.648281
1984 13.31 7.10071 1.1331
1985 12.843 13.7723 -0.125991
1986 59.526 19.1912 2.04136
1987 7.584 2.69155 1.86817
1988 1.763 12.3036 -3.50375
1989 2.855 5.49965 -1.18232
1990 4.733 7.17408 -0.750056
1991 7.337 4.44047 0.905604
1992 8.487 13.7891 -0.875254
1993 4.145 7.95528 -1.17569
1994 22.311 9.14972 1.60746
1995 13.067 10.071 0.469651
1996 6.493 7.10822 -0.163256
1997 7.997 6.80281 0.291662
1998 14.983 8.40798 1.04188
1999 8.565 6.27664 0.560581
2000 9.874 7.58702 0.47513
2001 13.543 6.90791 1.21404
2002 5.406 7.36093 -0.556663
2003 8.18 4.3818 1.12573
2004 6.993 6.93654 0.0146185
2005 2.198 3.32342 -0.745601
2006 9.658 7.40254 0.479635
index number 36
units = 2
month = 1
starting and ending ages for selectivity = 1 1
selectivity choice = -1
  year, obs index, pred index, standardized residual
1988 0.17 1.96287 -4.41174
1989 1 0.877393 0.235884
1990 1.28 1.14453 0.201744
1991 1 0.708416 0.621669
1992 1.1 2.19985 -1.24989
1993 2.55 1.26916 1.2583
1994 1.66 1.45971 0.231878
1995 4.95 1.60669 2.02919
1996 1.66 1.13402 0.68718
1997 1.65 1.08529 0.75548
1998 0.67 1.34138 -1.25186
1999 1.03 1.00135 0.0508711
2000 0.95 1.21041 -0.436867
2001 0.62 1.10206 -1.03734
2002 1.51 1.17433 0.453385
2003 0.6 0.699056 -0.275559
2004 0.9 1.10663 -0.372723
2005 3.11 0.530205 3.19039
2006 0.81 1.18097 -0.679983
index number 37
units = 2
month = 1
starting and ending ages for selectivity = 1 1

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selectivity choice = -1
  year, obs index, pred index, standardized residual
1982  0.55  0.81409  -0.707202
1983  0.96  0.86884  0.179932
1984  0.18  0.243317  -0.543555
1985  0.59  0.471931  0.402678
1986  0.39  0.657615  -0.94222
1987  0.07  0.0922302  -0.49736
1988  0.06  0.421603  -3.51609
1989  0.31  0.188454  0.897577
1990  0.44  0.245831  1.0498
1991  0.76  0.15216  2.90054
1992  0.99  0.472504  1.33389
1993  0.23  0.2726  -0.306444
1994  0.75  0.313529  1.57288
1995  0.93  0.345099  1.78779
1996  0.11  0.243574  -1.43359
1997  0.17  0.233109  -0.569342
1998  0.38  0.288113  0.499212
1999  0.21  0.215079  -0.0430957
2000  0.22  0.259981  -0.301133
2001  0.12  0.23671  -1.22512
2002  0.06  0.252234  -2.58968
2003  0.18  0.150149  0.327002
2004  0.36  0.237691  0.74864
2005  0.16  0.113882  0.61317
2006  0.31  0.25366  0.361722

```

index number 38

units = 2

month = 1

starting and ending ages for selectivity = 1 1

selectivity choice = -1

```

  year, obs index, pred index, standardized residual
1986  0.32  0.447973  -0.606679
1987  0.26  0.0628279  2.56131
1988  0.01  0.287199  -6.05502
1989  0.14  0.128376  0.156311
1990  0.36  0.167462  1.38021
1991  0.38  0.103652  2.34283
1992  0.37  0.321873  0.251293
1993  0.05  0.185697  -2.36621
1994  0.57  0.213579  1.77026
1995  0.3  0.235084  0.439733
1996  0.08  0.165925  -1.31558
1997  0.22  0.158796  0.58792
1998  0.39  0.196265  1.23835
1999  0.35  0.146513  1.57042
2000  0.21  0.177101  0.307271
2001  0.14  0.161249  -0.254832
2002  0.13  0.171824  -0.503025
2003  0.21  0.102283  1.29729
2004  0.27  0.161917  0.922136
2005  0.01  0.0775773  -3.69458
2006  0.17  0.172795  -0.0294071

```

index number 39

units = 2

month = 1

```

starting and ending ages for selectivity = 1 1
selectivity choice = -1
year, obs index, pred index, standardized residual
1990 0.02 0.0325733 -0.879617
1992 0.01 0.0626079 -3.30796
1993 0.01 0.0361202 -2.31603
1994 0.04 0.0415434 -0.0682761
1995 0.03 0.0457265 -0.760093
1996 0.02 0.0322742 -0.862985
1997 0.04 0.0308875 0.466223
1999 0.03 0.0284985 0.092597
2000 0.09 0.0344482 1.73189
2001 0.01 0.0313647 -2.06145
2002 0.11 0.0334216 2.14833
2003 0.05 0.0198952 1.6619
2004 0.1 0.0314947 2.08354
2005 0.04 0.0150897 1.75806
2006 0.04 0.0336105 0.313861

```

Input and Estimated effective sample sizes for index 1

```

1992 0 0
1993 0 0
1994 0 0
1995 0 0
1996 0 0
1997 0 0
1998 0 0
1999 0 0
2000 0 0
2001 0 0
2002 0 0
2003 0 0
2004 0 0
2005 0 0
2006 0 0
Total 0 0

```

Input and Estimated effective sample sizes for index 2

```

1992 0 0
1993 0 0
1994 0 0
1995 0 0
1996 0 0
1997 0 0
1998 0 0
1999 0 0
2000 0 0
2001 0 0
2002 0 0
2003 0 0
2004 0 0
2005 0 0
2006 0 0
Total 0 0

```

Input and Estimated effective sample sizes for index 3

```

1992 0 0
1993 0 0
1994 0 0

```

1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0

Total 0 0

Input and Estimated effective sample sizes for index 4

1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0

Total 0 0

Input and Estimated effective sample sizes for index 5

1992 0 0  
1993 0 0  
1994 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0

Total 0 0

Input and Estimated effective sample sizes for index 6

1982 0 0  
1983 0 0  
1984 0 0  
1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0

1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 7

1982 0 0  
1983 0 0  
1984 0 0  
1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0

Total 0 0

Input and Estimated effective sample sizes for index 8

1982 0 0  
1983 0 0  
1984 0 0  
1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1990 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0

1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 9

1982 0 0  
1983 0 0  
1984 0 0  
1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1991 0 0  
1994 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 10

1983 0 0  
1984 0 0  
1985 0 0  
1986 0 0  
1992 0 0  
1995 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 11

1983 0 0  
1984 0 0  
1985 0 0  
1986 0 0  
1987 0 0

1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 12

1983 0 0  
1984 0 0  
1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 13

1983 0 0  
1984 0 0  
1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1991 0 0  
1993 0 0  
1994 0 0

1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
Total	0	0

Input and Estimated effective sample sizes for index 14

1982	0	0
1983	0	0
1984	0	0
1985	0	0
1986	0	0
1987	0	0
1988	0	0
1989	0	0
1990	0	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
Total	0	0

Input and Estimated effective sample sizes for index 15

1982	0	0
1983	0	0
1984	0	0
1985	0	0
1986	0	0
1987	0	0
1988	0	0
1989	0	0
1990	0	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0



1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
Total	0	0

Input and Estimated effective sample sizes for index 16

1982	0	0
1983	0	0
1984	0	0
1985	0	0
1986	0	0
1987	0	0
1988	0	0
1989	0	0
1990	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
Total	0	0

Input and Estimated effective sample sizes for index 17

1982	0	0
1983	0	0
1984	0	0
1985	0	0
1986	0	0
1987	0	0
1988	0	0
1989	0	0
1990	0	0
1991	0	0
1992	0	0
1994	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0

2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 18

1984 0 0  
1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 19

1984 0 0  
1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 20

1985 0 0  
1986 0 0  
1987 0 0

1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 21

1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 22

1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0

1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
Total	0	0

Input and Estimated effective sample sizes for index 23

1985	0	0
1986	0	0
1987	0	0
1988	0	0
1989	0	0
1990	0	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
Total	0	0

Input and Estimated effective sample sizes for index 24

1985	0	0
1986	0	0
1987	0	0
1988	0	0
1989	0	0
1990	0	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0

2006	0	0
Total	0	0

Input and Estimated effective sample sizes for index 25

1982	0	0
1983	0	0
1984	0	0
1985	0	0
1986	0	0
1987	0	0
1988	0	0
1989	0	0
1990	0	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
Total	0	0

Input and Estimated effective sample sizes for index 26

1982	0	0
1983	0	0
1984	0	0
1985	0	0
1986	0	0
1987	0	0
1988	0	0
1992	0	0
1993	0	0
1994	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
Total	0	0

Input and Estimated effective sample sizes for index 27

1990	0	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0

1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 28

1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 29

1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 30

1988 0 0  
1989 0 0  
1990 0 0

1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 31

1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 32

1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 33

1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0

1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 34

1982 0 0  
1983 0 0  
1984 0 0  
1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 35

1982 0 0  
1983 0 0  
1984 0 0  
1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0



1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 36

1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 37

1982 0 0  
1983 0 0  
1984 0 0  
1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0

2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 38

1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 39

1990 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Survey proportions at age by index

Index number 1  
N/A  
Index number 2  
N/A  
Index number 3  
N/A  
Index number 4  
N/A  
Index number 5  
N/A  
Index number 6

N/A  
Index number 7  
N/A  
Index number 8  
N/A  
Index number 9  
N/A  
Index number 10  
N/A  
Index number 11  
N/A  
Index number 12  
N/A  
Index number 13  
N/A  
Index number 14  
N/A  
Index number 15  
N/A  
Index number 16  
N/A  
Index number 17  
N/A  
Index number 18  
N/A  
Index number 19  
N/A  
Index number 20  
N/A  
Index number 21  
N/A  
Index number 22  
N/A  
Index number 23  
N/A  
Index number 24  
N/A  
Index number 25  
N/A  
Index number 26  
N/A  
Index number 27  
N/A  
Index number 28  
N/A  
Index number 29  
N/A  
Index number 30  
N/A  
Index number 31  
N/A  
Index number 32  
N/A  
Index number 33  
N/A  
Index number 34  
N/A

Index number 35  
 N/A  
 Index number 36  
 N/A  
 Index number 37  
 N/A  
 Index number 38  
 N/A  
 Index number 39  
 N/A

Index Selectivity at Age

0 1 0 0 0 0 0 0  
 0 0 1 0 0 0 0 0  
 0 0 0 1 0 0 0 0  
 0 0 0 0 1 0 0 0  
 0 0 0 0 0 1 1 1  
 0 1 0 0 0 0 0 0  
 0 0 1 0 0 0 0 0  
 0 0 0 1 0 0 0 0  
 0 0 0 0 1 0 0 0  
 0 0 0 0 0 1 1 1  
 0 0 1 0 0 0 0 0  
 0 0 0 1 0 0 0 0  
 0 0 0 0 1 0 0 0  
 0 0 1 0 0 0 0 0  
 0 0 0 1 0 0 0 0  
 0 0 0 1 0 0 0 0  
 0 0 0 0 1 0 0 0  
 0 0 1 0 0 0 0 0  
 0 0 0 1 0 0 0 0  
 0 0 0 1 0 0 0 0  
 0 0 0 0 1 0 0 0  
 0 0 1 0 0 0 0 0  
 0 0 0 1 0 0 0 0  
 0 0 0 0 1 0 0 0  
 0 0 0 0 0 1 1 1  
 0 0 0 1 0 0 0 0  
 0 0 0 0 1 0 0 0  
 0 1 0 0 0 0 0 0  
 0 0 1 0 0 0 0 0  
 0 1 0 0 0 0 0 0  
 0 0 1 0 0 0 0 0  
 0 0 0 1 0 0 0 0  
 0 0 0 0 1 0 0 0  
 1 0 0 0 0 0 0 0  
 1 0 0 0 0 0 0 0  
 1 0 0 0 0 0 0 0  
 1 0 0 0 0 0 0 0  
 1 0 0 0 0 0 0 0  
 1 0 0 0 0 0 0 0  
 1 0 0 0 0 0 0 0  
 1 0 0 0 0 0 0 0

Deviations section: only applicable if associated lambda > 0

Nyear1 observed, expected, standardized residual

2 141.934 9935.01 -5.51549  
 3 66.7132 3069.19 -4.97064  
 4 194.838 922.91 -2.01923

5 11323.2 281.933 4.7943  
6 1.87289 87.1656 -4.98564  
7 2.45433 27.1575 -3.1207  
8 4.12177 12.3833 -1.42815

Fleet Obs, Initial, and Standardized Residual for Fmult

1 0.521288 0.5 0.054129  
2 0.187429 0.2 -0.0842775  
3 3.05902e-07 0.05 -15.5843  
4 3.05902e-07 0.05 -15.5843  
5 0.248121 0.2 0.279897  
6 0.0552852 0.05 0.130449

Standardized Residuals for Fmult\_devs by fleet and year

N/A

Index Obs, Initial, and Standardized Residual for q\_year1

N/A

Standardized Residuals for catchability deviations by index and year

index 1 q\_devs standardized residuals

2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0

index 2 q\_devs standardized residuals

2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0

index 3 q\_devs standardized residuals

2 0  
3 0  
4 0  
5 0  
6 0  
7 0

8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
index 4 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
index 5 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
index 6 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
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16 0  
17 0  
18 0  
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21 0  
22 0  
23 0  
24 0  
25 0  
index 7 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
23 0  
24 0  
25 0  
index 8 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
23 0  
24 0  
index 9 q\_devs standardized residuals  
2 0  
3 0

4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
index 10 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
index 11 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
23 0  
24 0  
index 12 q\_devs standardized residuals



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2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
20 0
21 0
22 0
23 0
24 0
  index 13 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
20 0
21 0
22 0
  index 14 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
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13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
23 0  
24 0  
25 0  
index 15 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
23 0  
24 0  
25 0  
index 16 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0

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20 0
21 0
22 0
23 0
24 0
  index 17 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
20 0
21 0
22 0
  index 18 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
20 0
21 0
22 0
23 0
  index 19 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
```

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8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
20 0
21 0
22 0
23 0
  index 20 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
20 0
21 0
22 0
  index 21 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
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20 0
21 0
22 0
  index 22 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
20 0
21 0
22 0
  index 23 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
20 0
21 0
22 0
  index 24 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
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11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
index 25 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
23 0  
24 0  
25 0  
index 26 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0

```
index 27 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
index 28 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
index 29 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
index 30 q_devs standardized residuals
2 0
3 0
4 0
```

5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
index 31 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
index 32 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
index 33 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0



12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
index 34 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
23 0  
24 0  
25 0  
index 35 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
23 0  
24 0

25 0  
index 36 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
index 37 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
23 0  
24 0  
25 0  
index 38 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0

13 0  
14 0  
15 0  
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17 0  
18 0  
19 0  
20 0  
21 0

index 39 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0

Obs, Initial, and Standardized Residual for SRR steepness  
N/A

Obs, Initial, and Standardized Residual for SRR unexpl S  
N/A

End of Deviations Section

Selectivity by age and year for each fleet

fleet 1 selectivity at age

0.00580595	0.928253	0.999965	1	1	1	1	1
0.00580595	0.928253	0.999965	1	1	1	1	1
0.00580595	0.928253	0.999965	1	1	1	1	1
0.00580595	0.928253	0.999965	1	1	1	1	1
0.00580595	0.928253	0.999965	1	1	1	1	1
0.00580595	0.928253	0.999965	1	1	1	1	1
0.00580595	0.928253	0.999965	1	1	1	1	1
0.00580595	0.928253	0.999965	1	1	1	1	1
0.00580595	0.928253	0.999965	1	1	1	1	1
0.00580595	0.928253	0.999965	1	1	1	1	1
0.00580595	0.928253	0.999965	1	1	1	1	1
0.00580595	0.928253	0.999965	1	1	1	1	1
0.00580595	0.928253	0.999965	1	1	1	1	1
0.00373551	0.0887332	0.716613	0.985001	0.999414	0.999977	0.999999	1
0.00373551	0.0887332	0.716613	0.985001	0.999414	0.999977	0.999999	1
0.00373551	0.0887332	0.716613	0.985001	0.999414	0.999977	0.999999	1
0.00373551	0.0887332	0.716613	0.985001	0.999414	0.999977	0.999999	1
0.00373551	0.0887332	0.716613	0.985001	0.999414	0.999977	0.999999	1
0.00373551	0.0887332	0.716613	0.985001	0.999414	0.999977	0.999999	1
0.00373551	0.0887332	0.716613	0.985001	0.999414	0.999977	0.999999	1
0.00373551	0.0887332	0.716613	0.985001	0.999414	0.999977	0.999999	1
0.00373551	0.0887332	0.716613	0.985001	0.999414	0.999977	0.999999	1
0.00373551	0.0887332	0.716613	0.985001	0.999414	0.999977	0.999999	1







0.0020506 0.327849 0.353177 0.353189 0.353189 0.353189 0.353189 0.353189  
 0.00323894 0.517841 0.557847 0.557866 0.557866 0.557866 0.557866 0.557866  
 0.00831332 1.32913 1.43181 1.43186 1.43186 1.43186 1.43186 1.43186  
 0.00210104 0.335914 0.361865 0.361877 0.361877 0.361877 0.361877 0.361877  
 0.0021608 0.345468 0.372158 0.372171 0.372171 0.372171 0.372171 0.372171  
 0.002956 0.0702167 0.567073 0.779455 0.79086 0.791306 0.791323 0.791324  
 0.00195877 0.0465285 0.375766 0.516499 0.524057 0.524352 0.524364 0.524364  
 0.00108955 0.0258811 0.209017 0.287299 0.291503 0.291667 0.291673 0.291674  
 0.00102015 0.0242326 0.195703 0.268999 0.272935 0.273089 0.273095 0.273095  
 0.000866064 0.0205724 0.166144 0.228368 0.23171 0.231841 0.231846 0.231846  
 0.000730428 0.0173505 0.140124 0.192603 0.195422 0.195532 0.195536 0.195536  
 0.000696646 0.0165481 0.133643 0.183695 0.186383 0.186488 0.186493 0.186493  
 0.000790488 0.0187772 0.151646 0.20844 0.21149 0.21161 0.211614 0.211614  
 0.000684782 0.0162663 0.131367 0.180567 0.183209 0.183313 0.183317 0.183317  
 0.000885027 0.0210229 0.169782 0.233369 0.236783 0.236917 0.236922 0.236922  
 0.00109534 0.0260187 0.210128 0.288825 0.293052 0.293217 0.293223 0.293224  
 0.000861628 0.0204671 0.165293 0.227199 0.230523 0.230653 0.230658 0.230658  
 fleet 2 directed F at age  
 0.0166409 0.187429 0.187429 0.187429 0.187429 0.187429 0.187429 0.187429  
 0.0135902 0.153069 0.153069 0.153069 0.153069 0.153069 0.153069 0.153069  
 0.0215929 0.243205 0.243205 0.243205 0.243205 0.243205 0.243205 0.243205  
 0.0251535 0.283309 0.283309 0.283309 0.283309 0.283309 0.283309 0.283309  
 0.0162196 0.182684 0.182684 0.182684 0.182684 0.182684 0.182684 0.182684  
 0.011525 0.129808 0.129808 0.129808 0.129808 0.129808 0.129808 0.129808  
 0.0323189 0.364014 0.364014 0.364014 0.364014 0.364014 0.364014 0.364014  
 0.0183112 0.206242 0.206242 0.206242 0.206242 0.206242 0.206242 0.206242  
 0.0114526 0.128993 0.128993 0.128993 0.128993 0.128993 0.128993 0.128993  
 0.0157635 0.177547 0.177547 0.177547 0.177547 0.177547 0.177547 0.177547  
 0.0186981 0.210601 0.210601 0.210601 0.210601 0.210601 0.210601 0.210601  
 0.00875958 0.0986608 0.0986608 0.0986608 0.0986608 0.0986608 0.0986608 0.0986608  
 0.0986608  
 0.00974404 0.109749 0.109749 0.109749 0.109749 0.109749 0.109749 0.109749  
 0.001089 0.0189863 0.197599 0.409459 0.435119 0.436623 0.436707 0.436711  
 0.000907441 0.0158209 0.164655 0.341193 0.362574 0.363828 0.363897 0.363901  
 0.000206382 0.00359818 0.0374478 0.0775984 0.0824612 0.0827464 0.0827621  
 0.082763  
 0.000306766 0.00534835 0.0556626 0.115343 0.122571 0.122995 0.123018  
 0.123019  
 0.000247646 0.00431761 0.0449352 0.0931136 0.0989487 0.0992909 0.0993098  
 0.0993108  
 0.000249436 0.00434881 0.0452599 0.0937865 0.0996637 0.100008 0.100027  
 0.100028  
 0.000186733 0.00325561 0.0338826 0.0702106 0.0746104 0.0748684 0.0748827  
 0.0748835  
 0.000243583 0.00424677 0.0441979 0.0915858 0.0973251 0.0976617 0.0976803  
 0.0976813  
 0.000175276 0.00305586 0.0318037 0.0659028 0.0700326 0.0702749 0.0702882  
 0.070289  
 0.000245382 0.00427814 0.0445245 0.0922625 0.0980442 0.0983833 0.098402  
 0.098403  
 0.000251319 0.00438164 0.0456016 0.0944946 0.100416 0.100763 0.100783  
 0.100784  
 0.0002624 0.00457484 0.0476123 0.0986611 0.104844 0.105206 0.105226 0.105227  
 fleet 3 directed F at age  
 5.45068e-11 3.05902e-07 9.41026e-09 5.4458e-09 7.90214e-11 3.05902e-08  
 1.52951e-08 3.05902e-09

1.70382e-17 9.56217e-14 2.94154e-15 1.7023e-15 2.47012e-17 9.56217e-15  
4.78108e-15 9.56217e-16  
8.70734e-24 4.88672e-20 1.50327e-21 8.69954e-22 1.26235e-23 4.88672e-21  
2.44336e-21 4.88672e-22  
3.27591e-30 1.8385e-26 5.65565e-28 3.27297e-28 4.74926e-30 1.8385e-27  
9.1925e-28 1.8385e-28  
9.30099e-24 5.21989e-20 1.60576e-21 9.29266e-22 1.34841e-23 5.21989e-21  
2.60995e-21 5.21989e-22  
6.30341e-18 3.53759e-14 1.08825e-15 6.29777e-16 9.13839e-18 3.53759e-15  
1.7688e-15 3.53759e-16  
2.48976e-12 1.3973e-08 4.29842e-10 2.48753e-10 3.60954e-12 1.3973e-09  
6.9865e-10 1.3973e-10  
8.13907e-06 0.045678 0.00140516 0.000813178 1.17996e-05 0.0045678 0.0022839  
0.00045678  
5.05355e-05 0.283615 0.00872465 0.00504903 7.3264e-05 0.0283615 0.0141807  
0.00283615  
4.2425e-05 0.238097 0.00732442 0.0042387 6.15058e-05 0.0238097 0.0119049  
0.00238097  
6.42161e-05 0.360393 0.0110865 0.00641586 9.30975e-05 0.0360393 0.0180197  
0.00360393  
1.32057e-05 0.074113 0.00227989 0.00131939 1.9145e-05 0.0074113 0.00370565  
0.00074113  
1.01894e-05 0.0571846 0.00175913 0.00101802 1.47721e-05 0.00571846  
0.00285923 0.000571846  
2.15214e-06 0.0120782 0.000371555 0.000215022 3.12008e-06 0.00120782  
0.000603912 0.000120782  
4.49369e-06 0.0252194 0.000775807 0.000448966 6.51474e-06 0.00252194  
0.00126097 0.000252194  
4.59572e-06 0.0257921 0.000793424 0.000459161 6.66267e-06 0.00257921  
0.0012896 0.000257921  
4.7136e-06 0.0264536 0.000813774 0.000470938 6.83356e-06 0.00264536  
0.00132268 0.000264536  
2.39787e-05 0.134573 0.00413978 0.00239572 3.47632e-05 0.0134573 0.00672865  
0.00134573  
1.12715e-05 0.063258 0.00194596 0.00112615 1.6341e-05 0.0063258 0.0031629  
0.00063258  
3.35578e-06 0.0188333 0.000579356 0.000335278 4.86506e-06 0.00188333  
0.000941665 0.000188333  
5.25178e-06 0.029474 0.000906688 0.000524708 7.61379e-06 0.0029474 0.0014737  
0.00029474  
6.94051e-06 0.0389514 0.00119824 0.000693429 1.0062e-05 0.00389514  
0.00194757 0.000389514  
4.21607e-06 0.0236614 0.000727878 0.000421229 6.11226e-06 0.00236614  
0.00118307 0.000236614  
3.04176e-06 0.0170709 0.000525141 0.000303904 4.4098e-06 0.00170709  
0.000853547 0.000170709  
8.05899e-06 0.0452286 0.00139134 0.000805178 1.16836e-05 0.00452286  
0.00226143 0.000452286  
fleet 4 directed F at age  
2.97204e-11 2.38456e-09 3.05902e-07 6.75599e-09 8.07701e-11 3.05902e-08  
1.52951e-08 3.05902e-09  
1.12676e-16 9.04037e-15 1.15974e-12 2.56134e-14 3.06217e-16 1.15974e-13  
5.79871e-14 1.15974e-14  
4.47079e-23 3.58705e-21 4.60164e-19 1.01629e-20 1.21501e-22 4.60164e-20  
2.30082e-20 4.60164e-21  
3.94956e-27 3.16885e-25 4.06515e-23 8.97807e-25 1.07336e-26 4.06515e-24  
2.03258e-24 4.06515e-25



2.91334e-30 2.33746e-28 2.9986e-26 6.62255e-28 7.91748e-30 2.9986e-27  
 1.4993e-27 2.9986e-28  
 2.23011e-24 1.78929e-22 2.29538e-20 5.06945e-22 6.06069e-24 2.29538e-21  
 1.14769e-21 2.29538e-22  
 2.99665e-27 2.4043e-25 3.08436e-23 6.81194e-25 8.14389e-27 3.08436e-24  
 1.54218e-24 3.08436e-25  
 4.62761e-31 3.71287e-29 4.76305e-27 1.05194e-28 1.25763e-30 4.76305e-28  
 2.38152e-28 4.76305e-29  
 2.35027e-28 1.8857e-26 2.41906e-24 5.3426e-26 6.38725e-28 2.41906e-25  
 1.20953e-25 2.41906e-26  
 4.44757e-23 3.56842e-21 4.57774e-19 1.01101e-20 1.2087e-22 4.57774e-20  
 2.28887e-20 4.57774e-21  
 8.76892e-19 7.03557e-17 9.02557e-15 1.99334e-16 2.3831e-18 9.02557e-16  
 4.51278e-16 9.02557e-17  
 1.77409e-12 1.42341e-10 1.82601e-08 4.03283e-10 4.82138e-12 1.82601e-09  
 9.13007e-10 1.82601e-10  
 5.79953e-06 0.000465314 0.0596927 0.00131834 1.57612e-05 0.00596927  
 0.00298463 0.000596927  
 4.93546e-06 0.000395987 0.0507991 0.00112192 1.34129e-05 0.00507991  
 0.00253996 0.000507991  
 1.78744e-06 0.000143412 0.0183976 0.000406318 4.85767e-06 0.00183976  
 0.000919878 0.000183976  
 8.53403e-07 6.84711e-05 0.0087838 0.000193994 2.31926e-06 0.00087838  
 0.00043919 8.7838e-05  
 1.75145e-06 0.000140524 0.0180271 0.000398136 4.75985e-06 0.00180271  
 0.000901355 0.000180271  
 5.10191e-06 0.000409342 0.0525124 0.00115976 1.38653e-05 0.00525124  
 0.00262562 0.000525124  
 1.41981e-06 0.000113916 0.0146137 0.00032275 3.85858e-06 0.00146137  
 0.000730684 0.000146137  
 2.77402e-06 0.000222568 0.0285521 0.000630585 7.53885e-06 0.00285521  
 0.0014276 0.000285521  
 1.30767e-06 0.000104918 0.0134594 0.000297256 3.5538e-06 0.00134594  
 0.000672969 0.000134594  
 7.76046e-07 6.22646e-05 0.00798759 0.00017641 2.10903e-06 0.000798759  
 0.00039938 7.98759e-05  
 7.01627e-07 5.62937e-05 0.00722162 0.000159493 1.90679e-06 0.000722162  
 0.000361081 7.22162e-05  
 1.30487e-06 0.000104694 0.0134306 0.000296622 3.54621e-06 0.00134306  
 0.000671532 0.000134306  
 8.42588e-07 6.76034e-05 0.00867249 0.000191536 2.28987e-06 0.000867249  
 0.000433624 8.67249e-05  
 fleet 5 directed F at age  
 0.234393 0.248049 0.24812 0.248121 0.248121 0.248121 0.248121 0.248121  
 0.300554 0.318064 0.318157 0.318157 0.318157 0.318157 0.318157 0.318157  
 0.285799 0.30245 0.302537 0.302538 0.302538 0.302538 0.302538 0.302538  
 0.214628 0.227132 0.227198 0.227198 0.227198 0.227198 0.227198 0.227198  
 0.272439 0.288311 0.288395 0.288395 0.288395 0.288395 0.288395 0.288395  
 0.262239 0.277517 0.277597 0.277598 0.277598 0.277598 0.277598 0.277598  
 0.317467 0.335962 0.33606 0.33606 0.33606 0.33606 0.33606 0.33606  
 0.106847 0.113072 0.113104 0.113104 0.113104 0.113104 0.113104 0.113104  
 0.14986 0.158591 0.158637 0.158637 0.158637 0.158637 0.158637 0.158637  
 0.323391 0.342231 0.34233 0.342331 0.342331 0.342331 0.342331 0.342331  
 0.201751 0.213506 0.213567 0.213568 0.213568 0.213568 0.213568 0.213568  
 0.19307 0.204318 0.204377 0.204377 0.204377 0.204377 0.204377 0.204377  
 0.165232 0.174858 0.174909 0.174909 0.174909 0.174909 0.174909 0.174909  
 0.00525752 0.0647318 0.244412 0.298205 0.302532 0.302817 0.302836 0.302837

0.00781595 0.0962318 0.363348 0.443318 0.449751 0.450175 0.450203 0.450205  
0.00694886 0.0855559 0.323039 0.394137 0.399856 0.400233 0.400258 0.400259  
0.00626289 0.0771102 0.29115 0.355229 0.360384 0.360724 0.360746 0.360747  
0.00386591 0.047598 0.179718 0.219273 0.222455 0.222665 0.222678 0.222679  
0.00638621 0.0786285 0.296882 0.362224 0.36748 0.367827 0.367849 0.367851  
0.0041416 0.0509923 0.192535 0.23491 0.238319 0.238544 0.238558 0.238559  
0.0025761 0.0317175 0.119758 0.146115 0.148236 0.148376 0.148385 0.148385  
0.0032056 0.039468 0.149022 0.18182 0.184459 0.184633 0.184644 0.184645  
0.00307873 0.037906 0.143124 0.174624 0.177158 0.177325 0.177336 0.177337  
0.00374018 0.04605 0.173874 0.212142 0.21522 0.215423 0.215436 0.215437  
0.00418246 0.0514954 0.194434 0.237228 0.24067 0.240897 0.240912 0.240913  
fleet 6 directed F at age  
0.00346068 0.0552852 0.0448186 0.0290249 0.0170214 0.00931829 0.0048925  
0.00250976  
0.00138681 0.0221546 0.0179603 0.0116312 0.00682103 0.00373414 0.00196059  
0.00100574  
0.00129988 0.0207659 0.0168345 0.0109022 0.00639348 0.00350008 0.00183769  
0.000942704  
0.000546565 0.00873151 0.00707846 0.00458408 0.00268829 0.00147169  
0.000772702 0.000396382  
0.00295796 0.0472542 0.038308 0.0248086 0.0145488 0.00796467 0.00418179  
0.00214518  
0.00205789 0.0328753 0.0266513 0.0172597 0.0101218 0.00554112 0.00290933  
0.00149243  
0.00368511 0.0588706 0.0477252 0.0309073 0.0181253 0.00992261 0.0052098  
0.00267253  
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0.000239352  
0.00176563 0.0282064 0.0228664 0.0148085 0.00868429 0.00475418 0.00249615  
0.00128048  
0.0037086 0.0592459 0.0480294 0.0311043 0.0182408 0.00998587 0.00524301  
0.00268957  
0.00510778 0.0815981 0.0661499 0.0428393 0.0251227 0.0137533 0.00722108  
0.00370428  
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0.00330146  
0.00334895 0.0535003 0.0433716 0.0280879 0.0164719 0.00901746 0.00473455  
0.00242874  
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6.6732e-05  
0.00298268 0.0314535 0.0398903 0.0169274 0.00487087 0.00122338 0.000296028  
7.09726e-05







0.129859 1.06788 1.07654 1.07446 1.07252 1.07634 1.07363 1.07158  
0.165179 0.927253 0.672397 0.660676 0.649576 0.673934 0.657495 0.644935  
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0.180501 0.741226 0.761639 0.687253 0.673331 0.677534 0.667407 0.660426  
0.0132477 0.207938 1.11292 1.51081 1.53496 1.53865 1.5344 1.53159  
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0.0105172 0.164802 0.609399 0.772552 0.777531 0.779034 0.776647 0.775096  
0.0106982 0.165997 0.602842 0.758044 0.760966 0.762527 0.75939 0.75738  
0.00833151 0.242511 0.491889 0.563168 0.558588 0.573868 0.563518 0.555786  
0.0112803 0.204843 0.551005 0.672204 0.668957 0.672754 0.667693 0.664287  
0.00975224 0.139638 0.452332 0.516575 0.507035 0.506576 0.502771 0.500522  
0.0064212 0.113895 0.367474 0.46288 0.461642 0.463091 0.460104 0.458177  
0.00705605 0.129257 0.361269 0.446087 0.442584 0.444137 0.440892 0.438791  
0.0083242 0.130268 0.420348 0.524162 0.518706 0.5174 0.514613 0.513069  
0.0100544 0.145965 0.509937 0.62423 0.616801 0.614489 0.61146 0.609868  
0.00969079 0.167974 0.47592 0.588916 0.583196 0.583941 0.579926 0.577442

Average F for ages 3 to 5

Freport unweighted in .std and MCMC files

year	unweighted	Nweighted	Bweighted
1982	0.98712	0.974221	0.974041
1983	0.990612	0.990034	0.988165
1984	1.0797	1.08514	1.08513
1985	1.40665	1.40835	1.40809
1986	1.24345	1.24708	1.24417
1987	1.00908	1.01562	1.01362
1988	2.04033	2.05284	2.05109
1989	1.07451	1.07488	1.07458
1990	0.660883	0.670983	0.669797
1991	1.11407	1.12493	1.12184
1992	1.90658	1.92037	1.91342
1993	0.70596	0.715317	0.710301
1994	0.707407	0.758347	0.754387
1995	1.38623	1.26793	1.30055
1996	1.20664	1.0187	1.05256
1997	0.719827	0.643643	0.651303
1998	0.707284	0.668238	0.683283
1999	0.537882	0.520782	0.529045
2000	0.630722	0.597362	0.612426
2001	0.491981	0.480492	0.485946
2002	0.430665	0.404369	0.414133
2003	0.416647	0.399284	0.40863
2004	0.487739	0.466956	0.478453
2005	0.583656	0.574129	0.584758
2006	0.549344	0.516056	0.53054

Population Numbers at the Start of the Year

97062.2 141.934 66.7132 194.838 11323.2 1.87289 2.45433 4.12177  
103590 61425.9 43.8472 20.0607 59.5196 3500.81 0.583523 2.06103  
29010.2 61680.2 19176.4 13.2539 6.10222 18.1924 1073.34 0.812862  
56267.3 17390.4 17644.9 5304.38 3.68788 1.70562 5.09965 301.606  
78406 36039.3 3703.7 3530.8 1064.04 0.74118 0.343207 61.7818  
10996.4 47748.6 8788.35 863.707 834.555 254.095 0.178164 15.0206  
50266.8 6809.77 14642.9 2600.53 257.983 251.061 76.791 4.61183  
22469 28682.3 775.181 1534.47 277.127 27.8457 27.3218 8.90182

29309.9 16155.7 8071.99 216.277 429.009 77.6304 7.77055 10.141  
18141.7 20343.2 5233.2 3373.68 91.4586 183.442 32.3957 7.65287  
56335.6 10507.3 4383.22 1379.81 907.48 25.0241 49.4203 10.9959  
32501.5 36502.9 957.759 519.218 168.076 113.231 3.04657 7.56305  
37381.4 21602.1 13621.7 379.349 210.168 69.2061 46.7513 4.44178  
41145.4 25550.9 8428.05 5207.1 156.21 87.7575 28.7764 21.5162  
29040.8 33243.7 16991.9 2267.42 941.027 27.5567 15.424 8.88761  
27793.1 23457.2 21976.7 5321.87 496.916 201.531 5.88475 5.21085  
34351 22517 16287.1 9782.4 2012.29 186.959 75.7099 4.18133  
25643.4 27825 15615.6 7297.5 3752.95 769.746 71.4046 30.6117  
30997 20820.8 17875.4 7817.65 3402 1757.61 355.027 47.6528  
28222.5 25093.5 13889.2 8435.25 3268.01 1426.76 734.326 169.161  
30073.3 22882.4 17867.3 7233.9 4119.96 1611.47 703.865 447.606  
17902 24464.3 16717.8 10130 3728.1 2125.91 830.319 595.523  
28339.4 14553.8 17601 9537.23 5309.04 1960.73 1116.35 751.825  
13577.9 23010 10460.3 9465.09 4622.99 2587.53 956.873 914.819  
30243.3 11005.4 16280.5 5143.07 4151.13 2042.63 1145.93 832.07

q by index

index 1 q over time

1992 0.000163468  
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index 2 q over time

1992 0.000544383  
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index 3 q over time

1992 0.00042715  
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index 4 q over time

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index 5 q over time

1992 0.000427125  
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index 6 q over time

1982 2.00161e-05  
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index 7 q over time  
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index 9 q over time

1982 7.18747e-05  
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index 10 q over time

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index 11 q over time

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index 12 q over time

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index 13 q over time

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index 14 q over time  
1982 9.31499e-05  
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index 15 q over time  
1982 9.14703e-05  
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index 16 q over time  
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index 17 q over time  
1982 0.000110505  
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index 18 q over time  
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index 19 q over time  
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index 20 q over time  
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index 21 q over time  
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index 22 q over time  
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index 23 q over time  
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index 24 q over time

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index 25 q over time

1982 0.000240913  
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 index 26 q over time  
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 index 27 q over time  
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 index 28 q over time  
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index 29 q over time  
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index 30 q over time  
1988 9.91401e-05  
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index 31 q over time  
1990 5.1315e-05  
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index 32 q over time

1992 8.58346e-05  
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index 33 q over time

1985 1.86796e-06  
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index 34 q over time

1982 2.89017e-05  
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index 35 q over time

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index 36 q over time

1988 3.90491e-05  
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index 37 q over time

1982 8.3873e-06

1983 8.3873e-06  
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index 38 q over time  
1986 5.7135e-06  
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index 39 q over time  
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Proportions of catch at age by fleet

fleet 1  
Year 1 Obs = 0.0999237 0.477013 0.390403 0.0160876 0.00422994 0.0067263  
0.00395257 0.00166424  
Year 1 Pred = 0.0615149 0.0105437 0.00528093 0.015522 0.906459 0.000150399  
0.000197444 0.000331906  
Year 2 Obs = 0.10236 0.634204 0.227746 0.0289916 0.00156994 0.00324454  
0.000680308 0.00120362  
Year 2 Pred = 0.0129341 0.928445 0.0007047 0.000323243 0.000960914 0.0565892  
9.43918e-06 3.33525e-05  
Year 3 Obs = 0.0664268 0.506889 0.31883 0.0766062 0.0272241 0.00340893  
0.000142039 0.000473462  
Year 3 Pred = 0.00298161 0.738669 0.244113 0.000169121 7.80045e-05  
0.00023282 0.0137453 1.04133e-05  
Year 4 Obs = 0.0447546 0.343172 0.536416 0.0509351 0.0140125 0.00900421  
0.00133198 0.000372955  
Year 4 Pred = 0.013151 0.409802 0.437609 0.131678 9.16141e-05 4.23899e-05  
0.000126775 0.00749886  
Year 5 Obs = 0.0249296 0.431275 0.39042 0.135673 0.00967781 0.00569644  
0.00177631 0.000551268  
Year 5 Pred = 0.0158082 0.789545 0.0859204 0.0823363 0.0249109 1.73962e-05  
8.06714e-06 0.00145333  
Year 6 Obs = 0.0183903 0.493436 0.413006 0.0517919 0.0186673 0.00127403  
0.00132942 0.00210491  
Year 6 Pred = 0.00157162 0.805541 0.157439 0.0155317 0.0150506 0.00459088  
3.22241e-06 0.000271828  
Year 7 Obs = 0.0137816 0.502282 0.406308 0.0578374 0.0147757 0.00356965  
0.000813339 0.000632597  
Year 7 Pred = 0.0225917 0.260734 0.587743 0.104959 0.010456 0.010203  
0.00312558 0.000187869  
Year 8 Obs = 0.0113879 0.295492 0.572835 0.0997628 0.0180308 0.00189798  
0.000355872 0.000237248  
Year 8 Pred = 0.00665445 0.903626 0.0262184 0.0519437 0.00938833 0.000941912  
0.000925182 0.000301683  
Year 9 Obs = 0 0.651696 0.210154 0.112033 0.0197706 0.00439346 0.00146449  
0.000488162  
Year 9 Pred = 0.00949134 0.598819 0.358541 0.00965533 0.0192439 0.00344604  
0.000347377 0.0004558  
Year 10 Obs = 0 0.519579 0.450533 0.0196485 0.00844057 0.00152207  
0.00013837 0.00013837  
Year 10 Pred = 0.00552959 0.657586 0.196935 0.127963 0.0034924 0.0069622  
0.00123761 0.000293762  
Year 11 Obs = 0.0115983 0.586021 0.36372 0.034388 0.00193306 0.00223827 0  
0.00010174  
Year 11 Pred = 0.0391928 0.546609 0.267525 0.0850104 0.056365 0.00154146  
0.00306955 0.000687123  
Year 12 Obs = 0.0213669 0.609594 0.331116 0.0246215 0.00410358 0.00608462  
0.00268855 0.000424508  
Year 12 Pred = 0.00677607 0.942489 0.027317 0.0149468 0.00487381 0.00328727  
8.88082e-05 0.000221041

Year 13 Obs = 0.0151246 0.470005 0.469243 0.0345704 0.00813421 0.00152517  
0.000762583 0.000635486  
Year 13 Pred = 0.00806068 0.580154 0.390711 0.01123 0.0062588 0.00205725  
0.00139579 0.00013301  
Year 14 Obs = 0.00640312 0.357183 0.595768 0.0335468 0.00556793 0.00111359  
0.000278396 0.000139198  
Year 14 Pred = 0.0173923 0.233929 0.422512 0.308626 0.00931208 0.00522739  
0.00171678 0.00128495  
Year 15 Obs = 0 0.251933 0.573098 0.143499 0.0280525 0.00269736 0.000539471  
0.000179824  
Year 15 Pred = 0.00858986 0.212416 0.633469 0.101027 0.0421735 0.00123436  
0.000691682 0.000398853  
Year 16 Obs = 0 0.086758 0.557534 0.277169 0.059589 0.0157534 0.00228311  
0.000913242  
Year 16 Pred = 0.00569526 0.106094 0.656777 0.203908 0.0192777 0.00781778  
0.000228515 0.000202478  
Year 17 Obs = 0 0.0439265 0.385253 0.45316 0.0979381 0.0161363 0.00336172  
0.000224115  
Year 17 Pred = 0.00662072 0.0957429 0.459155 0.354726 0.0739455 0.00686955  
0.00278559 0.000153974  
Year 18 Obs = 0 0.0307962 0.39309 0.381072 0.14647 0.0400601 0.00650976  
0.002003  
Year 18 Pred = 0.00469388 0.1083 0.43842 0.272922 0.142697 0.0290896  
0.00271074 0.00116605  
Year 19 Obs = 0 0.0548229 0.500129 0.280062 0.116111 0.0307732 0.0121541  
0.00594776  
Year 19 Pred = 0.00535727 0.0779794 0.462343 0.263719 0.116604 0.0601779  
0.0121823 0.00163753  
Year 20 Obs = 0 0.192057 0.381393 0.272035 0.0900435 0.0421654 0.0160501  
0.0062568  
Year 20 Pred = 0.00494308 0.0981263 0.380003 0.30831 0.121705 0.0531755  
0.027415 0.00632167  
Year 21 Obs = 0 0.0797956 0.53184 0.270244 0.0752752 0.0261399 0.0147406  
0.00196541  
Year 21 Pred = 0.00464383 0.079727 0.447021 0.238335 0.137802 0.0538951  
0.0235724 0.0150032  
Year 22 Obs = 0 0.0960949 0.431814 0.276631 0.108771 0.0521366 0.0224903  
0.012063  
Year 22 Pred = 0.0025383 0.077725 0.385256 0.308855 0.115511 0.0658603  
0.025761 0.0184937  
Year 23 Obs = 0 0.048398 0.439966 0.297639 0.126138 0.0507589 0.0202361  
0.0168634  
Year 23 Pred = 0.00401573 0.0462162 0.394942 0.280887 0.15903 0.0587996  
0.0335197 0.0225899  
Year 24 Obs = 0 0.084207 0.228491 0.271093 0.181561 0.112332 0.0605758  
0.0617407  
Year 24 Pred = 0.00232233 0.0876187 0.272462 0.322375 0.160274 0.0898475  
0.0332701 0.0318298  
Year 25 Obs = 0 0.0787154 0.466205 0.232997 0.121327 0.0579345 0.0277078  
0.0151134  
Year 25 Pred = 0.00548825 0.0439977 0.456674 0.188689 0.15491 0.0762444  
0.0428493 0.031147  
fleet 2  
Year 1 Obs = 0.172408 0.608612 0.179438 0.0249561 0.00913884 0.00333919  
0.00105448 0.00105448  
Year 1 Pred = 0.500369 0.00604186 0.00280912 0.00825643 0.482162 8.00002e-05  
0.000105024 0.000176547

Year 2 Obs = 0.0778358 0.59769 0.250119 0.0454042 0.0213574 0.00648632  
0.000474608 0.000632811  
Year 2 Pred = 0.157398 0.795952 0.000560811 0.000257233 0.000764684 0.045033  
7.51159e-06 2.65415e-05  
Year 3 Obs = 0.0814915 0.508356 0.349416 0.049416 0.00961366 0.00161725  
8.98473e-05 0  
Year 3 Pred = 0.0414607 0.723608 0.221986 0.000153786 7.09315e-05  
0.000211709 0.012499 9.46907e-06  
Year 4 Obs = 0.0274049 0.415828 0.493428 0.0472595 0.0118848 0.0033557  
0.000699105 0.000139821  
Year 4 Pred = 0.164889 0.361972 0.358813 0.107965 7.51154e-05 3.4756e-05  
0.000103944 0.0061484  
Year 5 Obs = 0.0420725 0.482665 0.369497 0.0932996 0.00564862 0.00623296  
0.00019478 0.00038956  
Year 5 Pred = 0.187838 0.660915 0.0667646 0.0639773 0.0193563 1.35173e-05  
6.26837e-06 0.00112928  
Year 6 Obs = 0.054914 0.570351 0.306151 0.0624558 0.00589206 0.000235682 0  
0  
Year 6 Pred = 0.022156 0.800018 0.145146 0.0143185 0.013875 0.00423228  
2.97071e-06 0.000250596  
Year 7 Obs = 0 0.495499 0.377951 0.0800068 0.0385595 0.00662477 0.000169866  
0.00118906  
Year 7 Pred = 0.25723 0.20914 0.437631 0.0781494 0.00778527 0.00759683  
0.00232721 0.000139882  
Year 8 Obs = 0.000823384 0.0201729 0.591601 0.294772 0.076163 0.0152326  
0.000411692 0.000823384  
Year 8 Pred = 0.0873515 0.835632 0.0225068 0.0445888 0.008059 0.000808543  
0.000794181 0.000258966  
Year 9 Obs = 0.00140449 0.100421 0.51264 0.293539 0.0821629 0.00842697  
0.000702247 0.000702247  
Year 9 Pred = 0.122799 0.545797 0.303359 0.00816901 0.0162815 0.00291556  
0.000293902 0.000385634  
Year 10 Obs = 0 0.142431 0.611857 0.194258 0.0432513 0.00745712 0.000745712  
0  
Year 10 Pred = 0.0748398 0.62699 0.174306 0.113256 0.003091 0.00616199  
0.00109537 0.000259998  
Year 11 Obs = 0 0.0214031 0.472652 0.414388 0.0778835 0.0124851 0.00118906  
0  
Year 11 Pred = 0.374024 0.367484 0.166958 0.0530518 0.0351753 0.00096197  
0.00191559 0.000428808  
Year 12 Obs = 0 0.269211 0.575536 0.13173 0.0230005 0.000522739 0 0  
Year 12 Pred = 0.0885873 0.868037 0.0233548 0.0127784 0.00416675 0.00281037  
7.59244e-05 0.000188974  
Year 13 Obs = 0.00277649 0.119389 0.583989 0.232763 0.0532161 0.00647848  
0.00138825 0  
Year 13 Pred = 0.106257 0.538762 0.336814 0.00968051 0.00539525 0.0017734  
0.00120321 0.000114658  
Year 14 Obs = 0 0.0642528 0.493788 0.304934 0.117501 0.0188143 0.000709975  
0  
Year 14 Pred = 0.0164851 0.162741 0.378787 0.417122 0.0131815 0.00742094  
0.0024376 0.00182447  
Year 15 Obs = 0 0.164492 0.620533 0.157119 0.0374362 0.015882 0.0036869  
0.000850822  
Year 15 Pred = 0.00881751 0.160038 0.615044 0.147874 0.0646521 0.00189776  
0.0010636 0.000613321  
Year 16 Obs = 0 0.0163305 0.600384 0.363112 0.0172911 0.00288184 0 0



Year 16 Pred = 0.00549377 0.0751143 0.599233 0.28047 0.0277712 0.0112948  
0.000330204 0.000292584  
Year 17 Obs = 0.0118421 0.359868 0.456579 0.151316 0.0184211 0.00197368 0 0  
Year 17 Pred = 0.00579687 0.0615278 0.38025 0.442871 0.0966905 0.00900855  
0.00365357 0.000201954  
Year 18 Obs = 0.000712758 0.0498931 0.35923 0.412687 0.108339 0.0627227  
0.00427655 0.00213828  
Year 18 Pred = 0.00407982 0.0690898 0.36043 0.338255 0.185229 0.0378691  
0.00352946 0.00151825  
Year 19 Obs = 0 0.028169 0.224225 0.510423 0.194366 0.0309859 0.0101408  
0.00169014  
Year 19 Pred = 0.00461471 0.0493012 0.376692 0.32392 0.150002 0.0776383  
0.0157195 0.00211303  
Year 20 Obs = 0 0.0539986 0.278879 0.380041 0.228298 0.0430622 0.0123035  
0.00341763  
Year 20 Pred = 0.00416101 0.0606265 0.302558 0.37007 0.153001 0.0670424  
0.03457 0.00797164  
Year 21 Obs = 0 0.0351423 0.255338 0.459075 0.204626 0.0311388 0.0133452  
0.00133452  
Year 21 Pred = 0.00396866 0.0500091 0.36134 0.290436 0.175876 0.068985  
0.0301775 0.0192073  
Year 22 Obs = 0 0.0262997 0.205505 0.435474 0.221407 0.075841 0.030581  
0.00489297  
Year 22 Pred = 0.00211204 0.0474674 0.3032 0.366445 0.143538 0.0820769  
0.0321095 0.0230515  
Year 23 Obs = 0 0.0106054 0.26867 0.381352 0.198409 0.10517 0.0251878  
0.0106054  
Year 23 Pred = 0.00328718 0.027767 0.305783 0.327859 0.194411 0.0720895  
0.0411028 0.0277005  
Year 24 Obs = 0 0.00888657 0.24621 0.434919 0.203346 0.0747517 0.0230005  
0.00888657  
Year 24 Pred = 0.00184977 0.0512234 0.205268 0.366144 0.190652 0.107186  
0.0396972 0.0379791  
Year 25 Obs = 0 0.00924499 0.223934 0.337956 0.229584 0.132512 0.048793  
0.0179764  
Year 25 Pred = 0.00459203 0.0270195 0.361408 0.225119 0.193568 0.0955469  
0.0537064 0.0390394  
fleet 3  
Year 1 Obs = 0 0 0 0 0 0 0 0  
Year 1 Pred = 0.135354 0.814374 0.0116478 0.0198118 0.0167883 0.00107831  
0.000707803 0.000237965  
Year 2 Obs = 0 0 0 0 0 0 0 0  
Year 2 Pred = 0.000394463 0.993954 2.15434e-05 5.71852e-06 2.46674e-07  
0.00562354 4.69009e-07 3.3144e-07  
Year 3 Obs = 0 0 0 0 0 0 0 0  
Year 3 Pred = 0.000113801 0.989659 0.00933959 3.74437e-06 2.50601e-08  
2.89549e-05 0.000854727 1.29506e-07  
Year 4 Obs = 0 0 0 0 0 0 0 0  
Year 4 Pred = 0.000881663 0.964402 0.0294083 0.00512086 5.16981e-08  
9.26004e-06 1.3847e-05 0.000163812  
Year 5 Obs = 0 0 0 0 0 0 0 0  
Year 5 Pred = 0.000567303 0.994601 0.00309078 0.00171399 7.52469e-06  
2.0342e-06 4.71659e-07 1.69943e-05  
Year 6 Obs = 0 0 0 0 0 0 0 0  
Year 6 Pred = 5.52216e-05 0.99355 0.00554517 0.000316568 4.45127e-06  
0.000525611 1.84467e-07 3.11217e-06  
Year 7 Obs = 0 0 0 0 0 0 0 0

Year 7 Pred = 0.00229042 0.927905 0.0597301 0.00617262 8.9228e-06 0.00337053  
0.000516264 6.20622e-06  
Year 8 Obs = 0.310372 0.651982 0.0376452 0 0 0 0  
Year 8 Pred = 0.000209342 0.997866 0.00082678 0.000947898 2.48599e-06  
9.65518e-05 4.74184e-05 3.09243e-06  
Year 9 Obs = 0.338025 0.646259 0.0157166 0 0 0 0  
Year 9 Pred = 0.000443382 0.98194 0.0167892 0.000261639 7.56678e-06  
0.000524537 2.64379e-05 6.93793e-06  
Year 10 Obs = 0.206489 0.793511 0 0 0 0  
Year 10 Pred = 0.000236459 0.987086 0.00844164 0.00317419 1.25706e-06  
0.000970098 8.62232e-05 4.09322e-06  
Year 11 Obs = 0.421841 0.563915 0.0131483 0.00109569 0 0 0  
Year 11 Pred = 0.00200426 0.981212 0.0137136 0.00252176 2.42618e-05  
0.000256854 0.000255739 1.14495e-05  
Year 12 Obs = 0.378133 0.556484 0.06502 0.00036324 0 0 0  
Year 12 Pred = 0.000204483 0.998377 0.000826326 0.000261645 1.23798e-06  
0.000323236 4.36624e-06 2.17349e-06  
Year 13 Obs = 0.205618 0.603889 0.17753 0.0129636 0 0 0  
Year 13 Pred = 0.000387902 0.980015 0.0188471 0.000313482 2.53518e-06  
0.000322585 0.000109432 2.08564e-06  
Year 14 Obs = 0.181467 0.525097 0.265122 0.028314 0 0 0  
Year 14 Pred = 0.000311709 0.990543 0.00681472 0.00209579 9.04353e-07  
0.000196413 3.22523e-05 4.82792e-06  
Year 15 Obs = 0.0239334 0.663892 0.248699 0.0634755 0 0 0  
Year 15 Pred = 0.00016907 0.987785 0.0112208 0.000753428 4.49799e-06  
5.09349e-05 1.42705e-05 1.64579e-06  
Year 16 Obs = 0.0126984 0.395238 0.477778 0.114286 0 0 0  
Year 16 Pred = 0.000221116 0.97318 0.0229479 0.00299962 4.05565e-06  
0.000636332 9.29983e-06 1.64804e-06  
Year 17 Obs = 0.047619 0.306878 0.386243 0.259259 0 0 0  
Year 17 Pred = 0.000285467 0.975337 0.0178167 0.00579522 1.72768e-05  
0.000620972 0.000125899 1.39182e-06  
Year 18 Obs = 0.0319893 0.407531 0.416861 0.143619 0 0 0  
Year 18 Pred = 0.000179465 0.978302 0.0150854 0.00395378 2.9564e-05  
0.00233173 0.00010864 9.34648e-06  
Year 19 Obs = 0.0220441 0.164329 0.460922 0.352705 0 0 0  
Year 19 Pred = 0.000280706 0.965351 0.0218017 0.00523569 3.3107e-05  
0.00661056 0.000669097 1.79879e-05  
Year 20 Obs = 0.0226337 0.203704 0.218107 0.555556 0 0 0  
Year 20 Pred = 0.000207783 0.974529 0.0143753 0.0049105 2.77218e-05  
0.00468615 0.00120796 5.57092e-05  
Year 21 Obs = 0.0247148 0.235741 0.418251 0.321293 0 0 0  
Year 21 Pred = 0.000238446 0.967198 0.0206566 0.00463688 3.83414e-05  
0.0058017 0.00126873 0.000161503  
Year 22 Obs = 0.00319489 0.421725 0.408946 0.0894569 0.0399361 0.0159744  
0.0159744 0.00479233  
Year 22 Pred = 0.000133599 0.966533 0.0182484 0.00615941 3.29444e-05  
0.00726735 0.00142127 0.000204064  
Year 23 Obs = 0.00369004 0.143911 0.494465 0.195572 0.0811808 0.0332103  
0.0258303 0.0221402  
Year 23 Pred = 0.00034771 0.945461 0.0307753 0.00921531 7.46157e-05  
0.0106738 0.00304233 0.000410062  
Year 24 Obs = 0.0162602 0.166667 0.390244 0.211382 0.0894309 0.0528455  
0.0406504 0.0325203  
Year 24 Pred = 0.000109022 0.971812 0.011511 0.00573423 4.0771e-05  
0.00884274 0.00163718 0.000313261

Year 25 Obs = 0.0114286 0.14 0.517143 0.148571 0.0828571 0.0457143  
0.0314286 0.0228571  
Year 25 Pred = 0.000494654 0.936901 0.0370417 0.00644374 7.56565e-05  
0.0144068 0.00404822 0.000588527  
fleet 4  
Year 1 Obs = 0 0 0 0 0 0 0 0  
Year 1 Pred = 0.146857 0.0126319 0.75343 0.048907 0.0341455 0.00214567  
0.00140842 0.000473514  
Year 2 Obs = 0 0 0 0 0 0 0 0  
Year 2 Pred = 0.015046 0.542005 0.0489901 0.000496276 1.76376e-05 0.393389  
3.2809e-05 2.31855e-05  
Year 3 Obs = 0 0 0 0 0 0 0 0  
Year 3 Pred = 0.000198711 0.0247048 0.972251 1.48756e-05 8.20274e-08  
9.2724e-05 0.00273714 4.14724e-07  
Year 4 Obs = 0 0 0 0 0 0 0 0  
Year 4 Pred = 0.000495337 0.007746 0.98502 0.00654583 5.4447e-08 9.54129e-06  
1.42675e-05 0.000168787  
Year 5 Obs = 0 0 0 0 0 0 0 0  
Year 5 Pred = 0.00279457 0.0700437 0.907706 0.0192102 6.94848e-05 1.83776e-  
05 4.26111e-06 0.000153532  
Year 6 Obs = 0 0 0 0 0 0 0 0  
Year 6 Pred = 0.000159347 0.0409869 0.953952 0.00207838 2.4078e-05 0.0027816  
9.76226e-07 1.647e-05  
Year 7 Obs = 0 0 0 0 0 0 0 0  
Year 7 Pred = 0.000636627 0.00368718 0.989783 0.00390358 4.64914e-06  
0.00171816 0.000263171 3.16368e-06  
Year 8 Obs = 0 0 0 0 0 0 0 0  
Year 8 Pred = 0.00316241 0.215504 0.744609 0.0325797 7.03985e-05 0.00267496  
0.00131372 8.56757e-05  
Year 9 Obs = 0 0 0 0 0 0 0 0  
Year 9 Pred = 0.000435949 0.0138027 0.984156 0.000585306 1.39467e-05  
0.000945865 4.76739e-05 1.25108e-05  
Year 10 Obs = 0 0 0 0 0 0 0 0  
Year 10 Pred = 0.000448867 0.0267879 0.955358 0.0137094 4.47321e-06  
0.00337733 0.00030018 1.42503e-05  
Year 11 Obs = 0 0 0 0 0 0 0 0  
Year 11 Pred = 0.00238502 0.0166926 0.972897 0.00682757 5.41209e-05  
0.000560559 0.000558126 2.49875e-05  
Year 12 Obs = 0 0 0 0 0 0 0 0  
Year 12 Pred = 0.00314861 0.219775 0.758562 0.00916639 3.57338e-05  
0.00912806 0.000123301 6.13784e-05  
Year 13 Obs = 0 0.604376 0.362808 0.0328168 0 0 0 0  
Year 13 Pred = 0.000340402 0.0122949 0.986036 0.000625903 4.17043e-06  
0.000519171 0.000176121 3.35665e-06  
Year 14 Obs = 0 0.404255 0.524823 0.070922 0 0 0 0  
Year 14 Pred = 0.000731795 0.0332457 0.953818 0.0111947 3.97998e-06  
0.000845681 0.000138866 2.07873e-05  
Year 15 Obs = 0 0.741611 0.241611 0.0167785 0 0 0 0  
Year 15 Pred = 0.000246783 0.0206126 0.976447 0.00250216 1.23075e-05  
0.000136352 3.82019e-05 4.40576e-06  
Year 16 Obs = 0 0.220779 0.636364 0.142857 0 0 0 0  
Year 16 Pred = 0.000159047 0.0100074 0.984065 0.00490902 5.46849e-06  
0.00083943 1.22681e-05 2.17405e-06  
Year 17 Obs = 0.00595238 0.25 0.434524 0.309524 0 0 0 0  
Year 17 Pred = 0.000261653 0.0127804 0.973585 0.0120854 2.96847e-05  
0.00104385 0.000211635 2.33963e-06  
Year 18 Obs = 0.00208333 0.133333 0.497917 0.366667 0 0 0 0

Year 18 Pred = 0.000193583 0.0150863 0.970111 0.0097034 5.97796e-05  
0.00461278 0.000214919 1.84898e-05  
Year 19 Obs = 0.0111732 0.256983 0.458101 0.273743 0 0 0 0  
Year 19 Pred = 0.000209606 0.0103052 0.97055 0.00889506 4.63417e-05  
0.00905285 0.000916297 2.46336e-05  
Year 20 Obs = 0 0.0634146 0.243902 0.692683 0 0 0 0  
Year 20 Pred = 0.000232602 0.0155962 0.959391 0.0125069 5.81736e-05  
0.00962088 0.00248 0.000114373  
Year 21 Obs = 0.00564972 0.169492 0.468927 0.355932 0 0 0 0  
Year 21 Pred = 0.000187833 0.0108923 0.970105 0.0083106 5.66178e-05  
0.00838174 0.00183295 0.000233323  
Year 22 Obs = 0 0.387387 0.432432 0.117117 0.036036 0.00900901 0.00900901  
0.00900901  
Year 22 Pred = 0.000117992 0.0122036 0.960843 0.0123769 5.45423e-05  
0.0117712 0.00230208 0.000330532  
Year 23 Obs = 0 0.133333 0.609524 0.180952 0.047619 0.0190476 0.00952381 0  
Year 23 Pred = 0.000183426 0.00713031 0.967885 0.0110606 7.37864e-05  
0.0103267 0.00294338 0.000396724  
Year 24 Obs = 0 0.08 0.52 0.24 0.08 0.04 0.02 0.02  
Year 24 Pred = 0.000148697 0.0189493 0.936005 0.0177946 0.000104242  
0.0221194 0.00409526 0.000783595  
Year 25 Obs = 0 0.0887097 0.637097 0.169355 0.0564516 0.0241935 0.016129  
0.00806452  
Year 25 Pred = 0.000217721 0.00589539 0.971999 0.00645297 6.24232e-05  
0.0116295 0.00326782 0.000475074  
fleet 5  
Year 1 Obs = 0.177729 0.545789 0.226071 0.0362567 0.0138952 0 0.000258515 0  
Year 1 Pred = 0.914206 0.00103718 0.000482371 0.00141776 0.0827949 1.37373e-  
05 1.80343e-05 3.03159e-05  
Year 2 Obs = 0.10964 0.553058 0.237093 0.0638217 0.0251476 0.0104782 0  
0.00076205  
Year 2 Pred = 0.665339 0.316128 0.000222802 0.000102195 0.000303797  
0.0178909 2.98424e-06 1.05445e-05  
Year 3 Obs = 0.130587 0.526352 0.276452 0.0579113 0.00841202 0.000286123 0  
0  
Year 3 Pred = 0.315221 0.516908 0.158622 0.000109889 5.06845e-05 0.000151278  
0.00893124 6.76618e-06  
Year 4 Obs = 0.0905476 0.452015 0.395988 0.0427435 0.0133743 0.00533165 0 0  
Year 4 Pred = 0.677532 0.139748 0.138568 0.0416944 2.90086e-05 1.34223e-05  
4.0142e-05 0.00237443  
Year 5 Obs = 0.100594 0.551416 0.239566 0.0936236 0.0111006 0.00129077  
0.00240943 0  
Year 5 Pred = 0.711101 0.235085 0.0237548 0.0227631 0.00688699 4.80945e-06  
2.23029e-06 0.000401796  
Year 6 Obs = 0.059377 0.595041 0.263954 0.0569612 0.0231405 0.000127146  
0.000635728 0.000762873  
Year 6 Pred = 0.194288 0.659154 0.119624 0.0118008 0.0114353 0.0034881  
2.44835e-06 0.000206532  
Year 7 Obs = 0.0430723 0.576506 0.33243 0.0388554 0.00883534 0.000301205 0  
0  
Year 7 Pred = 0.786556 0.0600866 0.125769 0.0224591 0.00223738 0.00218322  
0.000668809 4.02002e-05  
Year 8 Obs = 0.042516 0.313337 0.552126 0.0786255 0.00931858 0.00116482  
0.00291206 0  
Year 8 Pred = 0.504619 0.453566 0.0122198 0.024209 0.00437555 0.00043899  
0.000431192 0.000140603  
Year 9 Obs = 0.0930416 0.7301 0.139431 0.0311017 0.0060622 0 0.000263574 0

Year 9 Pred = 0.598355 0.249877 0.138924 0.00374103 0.00745619 0.00133519  
 0.000134594 0.000176603  
 Year 10 Obs = 0.0141727 0.59443 0.371622 0.0130191 0.00659196 0.000164799 0  
 0  
 Year 10 Pred = 0.46262 0.364153 0.101266 0.0657976 0.00179576 0.0035799  
 0.000636369 0.00015105  
 Year 11 Obs = 0.0165934 0.639544 0.320472 0.0179928 0 0.00539784 0 0  
 Year 11 Pred = 0.864104 0.0797693 0.0362518 0.0115192 0.00763768 0.000208874  
 0.000415936 9.31079e-05  
 Year 12 Obs = 0.0121651 0.60502 0.357715 0.0244841 0.000307977 0.000307977  
 0 0  
 Year 12 Pred = 0.508472 0.468129 0.0125988 0.00689336 0.00224776 0.00151606  
 4.09576e-05 0.000101942  
 Year 13 Obs = 0.117858 0.596449 0.253319 0.0274504 0.00417723 0.000149187  
 0.000596748 0  
 Year 13 Pred = 0.55854 0.266088 0.166397 0.00478248 0.00266542 0.000876118  
 0.000594422 5.66446e-05  
 Year 14 Obs = 0.0694528 0.453999 0.428743 0.0348767 0.0078172 0.00481058  
 0.000300661 0  
 Year 14 Pred = 0.0558895 0.389637 0.329018 0.21333 0.00643599 0.00361426  
 0.00118704 0.00088846  
 Year 15 Obs = 0.0165785 0.419465 0.495641 0.0505931 0.017579 0.000142918 0  
 0  
 Year 15 Pred = 0.0283026 0.362767 0.505793 0.071602 0.0298865 0.000875072  
 0.00049037 0.000282769  
 Year 16 Obs = 0.000558114 0.160179 0.584345 0.204409 0.0382308 0.0122785 0  
 0  
 Year 16 Pred = 0.0211229 0.203953 0.590289 0.162675 0.0153776 0.00623855  
 0.000182361 0.000161584  
 Year 17 Obs = 0 0.110044 0.417682 0.388881 0.0737928 0.00902708 0.000573148  
 0  
 Year 17 Pred = 0.0252862 0.189534 0.424957 0.29142 0.0607416 0.00564504  
 0.00228915 0.000126533  
 Year 18 Obs = 0 0.0489408 0.482591 0.3701 0.0791332 0.0146092 0.00462625 0  
 Year 18 Pred = 0.0178094 0.212984 0.403103 0.222743 0.116447 0.0237474  
 0.00221301 0.000951951  
 Year 19 Obs = 0 0.0740931 0.528266 0.292783 0.0824253 0.0217921 0.000640943  
 0  
 Year 19 Pred = 0.0209643 0.158168 0.438438 0.221986 0.0981395 0.0506681  
 0.0102575 0.00137881  
 Year 20 Obs = 0 0.158292 0.373064 0.336419 0.101813 0.0228561 0.00680015  
 0.000755572  
 Year 20 Pred = 0.019079 0.196311 0.355427 0.255972 0.101033 0.04416  
 0.0227679 0.0052501  
 Year 21 Obs = 0.00030656 0.0594727 0.406806 0.369099 0.129062 0.0282036  
 0.00613121 0.000919681  
 Year 21 Pred = 0.0182043 0.161996 0.42465 0.20097 0.116184 0.0454575  
 0.0198828 0.0126549  
 Year 22 Obs = 0 0.0519851 0.367186 0.384075 0.142136 0.0375082 0.0135995  
 0.00350954  
 Year 22 Pred = 0.0101065 0.160405 0.371717 0.26452 0.0989178 0.0564209  
 0.0220697 0.0158438  
 Year 23 Obs = 0.00526662 0.0467413 0.341014 0.377441 0.14944 0.0482774  
 0.0263331 0.00548607  
 Year 23 Pred = 0.016524 0.09857 0.393812 0.248616 0.140742 0.0520576  
 0.0296775 0.0200005

Year 24 Obs = 0.000729927 0.0447689 0.291241 0.374453 0.183698 0.0579075  
0.0240876 0.0231144  
Year 24 Pred = 0.00925537 0.180995 0.263137 0.276362 0.137381 0.0770434  
0.0285299 0.027295  
Year 25 Obs = 0.000987167 0.017769 0.34847 0.325518 0.179911 0.078233  
0.0333169 0.0157947  
Year 25 Pred = 0.0223836 0.0930094 0.451346 0.165535 0.135885 0.0669058  
0.0376025 0.0273333  
fleet 6  
Year 1 Obs = 0.212871 0.787129 0 0 0 0 0  
Year 1 Pred = 0.686457 0.0117566 0.00443128 0.00843459 0.288861 2.62378e-05  
1.80851e-05 1.55953e-05  
Year 2 Obs = 0.158085 0.841915 0 0 0 0 0  
Year 2 Pred = 0.121235 0.869569 0.000496687 0.000147538 0.000257208  
0.00829231 7.26225e-07 1.31634e-06  
Year 3 Obs = 0.170732 0.829268 0 0 0 0 0  
Year 3 Pred = 0.0312955 0.774704 0.192667 8.64395e-05 2.33807e-05 3.82032e-  
05 0.00118421 4.60218e-07  
Year 4 Obs = 0.162602 0.837398 0 0 0 0 0  
Year 4 Pred = 0.140724 0.438166 0.352112 0.0686132 2.79949e-05 7.09123e-06  
1.11349e-05 0.000337871  
Year 5 Obs = 0.109729 0.890271 0 0 0 0 0  
Year 5 Pred = 0.149292 0.74505 0.0610148 0.0378641 0.00671815 2.56836e-06  
6.25341e-07 5.77915e-05  
Year 6 Obs = 0.0805471 0.919453 0 0 0 0 0  
Year 6 Pred = 0.0165156 0.845846 0.124408 0.00794789 0.00451659 0.000754212  
2.77954e-07 1.20279e-05  
Year 7 Obs = 0.0763889 0.923611 0 0 0 0 0  
Year 7 Pred = 0.229509 0.264669 0.448977 0.0519223 0.00303337 0.00162041  
0.00026063 8.03622e-06  
Year 8 Obs = 0.135417 0.864583 0 0 0 0 0  
Year 8 Pred = 0.0654078 0.887485 0.019378 0.0248619 0.0026352 0.000144736  
7.46428e-05 1.24857e-05  
Year 9 Obs = 0.113208 0.886792 0 0 0 0 0  
Year 9 Pred = 0.0974827 0.61454 0.276901 0.00482893 0.00564418 0.00055331  
2.9285e-05 1.97115e-05  
Year 10 Obs = 0.023976 0.976024 0 0 0 0 0  
Year 10 Pred = 0.0597822 0.710373 0.160099 0.0673672 0.00107823 0.00117672  
0.000109827 1.33728e-05  
Year 11 Obs = 0.024602 0.975398 0 0 0 0 0  
Year 11 Pred = 0.327349 0.45618 0.168017 0.0345748 0.0134438 0.000201273  
0.000210437 2.41649e-05  
Year 12 Obs = 0.0191657 0.980834 0 0 0 0 0  
Year 12 Pred = 0.065202 0.90618 0.0197652 0.00700351 0.00133924 0.000494501  
7.01423e-06 8.95573e-06  
Year 13 Obs = 0.175182 0.824818 0 0 0 0 0  
Year 13 Pred = 0.0838092 0.602723 0.305464 0.00568567 0.00185831 0.000334392  
0.00011912 5.82303e-06  
Year 14 Obs = 0.139278 0.860722 0 0 0 0 0  
Year 14 Pred = 0.110493 0.659763 0.187129 0.0421992 0.0003611 5.08835e-05  
4.0436e-06 7.25598e-07  
Year 15 Obs = 0.0384911 0.961509 0 0 0 0 0  
Year 15 Pred = 0.0574625 0.630829 0.295427 0.0145456 0.00172204 1.26519e-05  
1.71546e-06 2.37162e-07  
Year 16 Obs = 0.0172786 0.590353 0.37581 0.0165587 0 0 0  
Year 16 Pred = 0.05524 0.456832 0.444103 0.0425668 0.0011413 0.000116182  
8.21735e-07 1.74563e-07

Year 17 Obs = 0 0.403892 0.51592 0.0801887 0 0 0 0  
 Year 17 Pred = 0.0741962 0.476332 0.358725 0.085559 0.00505817 0.000117956  
 1.15737e-05 1.53376e-07  
 Year 18 Obs = 0.0471116 0.32922 0.553561 0.0701066 0 0 0 0  
 Year 18 Pred = 0.0520802 0.533452 0.339123 0.0651742 0.00966409 0.000494531  
 1.11508e-05 1.14998e-06  
 Year 19 Obs = 0 0.314914 0.588519 0.0965665 0 0 0 0  
 Year 19 Pred = 0.0680786 0.43992 0.409597 0.072128 0.00904449 0.00117171  
 5.73947e-05 1.84966e-06  
 Year 20 Obs = 0 0.524324 0.369231 0.0993763 0.00706861 0 0 0  
 Year 20 Pred = 0.0599393 0.528234 0.321237 0.0804633 0.00900801 0.000987963  
 0.000123248 6.81365e-06  
 Year 21 Obs = 0.0533049 0.401564 0.404407 0.140725 0 0 0 0  
 Year 21 Pred = 0.0601023 0.458086 0.403337 0.0663894 0.0108862 0.00106876  
 0.000113109 1.72597e-05  
 Year 22 Obs = 0.0298598 0.478367 0.365021 0.118221 0.00853138 0 0 0  
 Year 22 Pred = 0.0355673 0.483497 0.376341 0.0931445 0.00987949 0.00141399  
 0.000133828 2.30338e-05  
 Year 23 Obs = 0.0499706 0.298648 0.466784 0.180482 0.00411523 0 0 0  
 Year 23 Pred = 0.0678482 0.346652 0.465192 0.102141 0.0164005 0.00152217  
 0.000209967 3.39251e-05  
 Year 24 Obs = 0.109767 0.498271 0.31936 0.0691443 0.00345722 0 0 0  
 Year 24 Pred = 0.0340098 0.569644 0.278171 0.10161 0.0143268 0.00201605  
 0.000180639 4.14332e-05  
 Year 25 Obs = 0.0883694 0.314709 0.505701 0.0826682 0.00741163 0.00114025 0  
 0  
 Year 25 Pred = 0.0885205 0.31504 0.513502 0.0655016 0.0152509 0.00188423  
 0.00025623 4.4654e-05

Proportions of Discards at age by fleet

fleet 1  
 Year 1 Obs = 0 0 0 0 0 0 0 0  
 Year 1 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 2 Obs = 0 0 0 0 0 0 0 0  
 Year 2 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 3 Obs = 0 0 0 0 0 0 0 0  
 Year 3 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 4 Obs = 0 0 0 0 0 0 0 0  
 Year 4 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 5 Obs = 0 0 0 0 0 0 0 0  
 Year 5 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 6 Obs = 0 0 0 0 0 0 0 0  
 Year 6 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 7 Obs = 0 0 0 0 0 0 0 0  
 Year 7 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 8 Obs = 0 0 0 0 0 0 0 0  
 Year 8 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 9 Obs = 0 0 0 0 0 0 0 0  
 Year 9 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 10 Obs = 0 0 0 0 0 0 0 0  
 Year 10 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 11 Obs = 0 0 0 0 0 0 0 0  
 Year 11 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 12 Obs = 0 0 0 0 0 0 0 0  
 Year 12 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 13 Obs = 0 0 0 0 0 0 0 0  
 Year 13 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15





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Year 17 Obs = 0 0 0 0 0 0 0 0
Year 17 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 18 Obs = 0 0 0 0 0 0 0 0
Year 18 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 19 Obs = 0 0 0 0 0 0 0 0
Year 19 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 20 Obs = 0 0 0 0 0 0 0 0
Year 20 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 21 Obs = 0 0 0 0 0 0 0 0
Year 21 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 22 Obs = 0 0 0 0 0 0 0 0
Year 22 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 23 Obs = 0 0 0 0 0 0 0 0
Year 23 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 24 Obs = 0 0 0 0 0 0 0 0
Year 24 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 25 Obs = 0 0 0 0 0 0 0 0
Year 25 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
fleet 3
Year 1 Obs = 0 0 0 0 0 0 0 0
Year 1 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 2 Obs = 0 0 0 0 0 0 0 0
Year 2 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 3 Obs = 0 0 0 0 0 0 0 0
Year 3 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 4 Obs = 0 0 0 0 0 0 0 0
Year 4 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 5 Obs = 0 0 0 0 0 0 0 0
Year 5 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 6 Obs = 0 0 0 0 0 0 0 0
Year 6 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 7 Obs = 0 0 0 0 0 0 0 0
Year 7 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 8 Obs = 0 0 0 0 0 0 0 0
Year 8 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 9 Obs = 0 0 0 0 0 0 0 0
Year 9 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 10 Obs = 0 0 0 0 0 0 0 0
Year 10 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 11 Obs = 0 0 0 0 0 0 0 0
Year 11 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 12 Obs = 0 0 0 0 0 0 0 0
Year 12 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 13 Obs = 0 0 0 0 0 0 0 0
Year 13 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 14 Obs = 0 0 0 0 0 0 0 0
Year 14 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 15 Obs = 0 0 0 0 0 0 0 0
Year 15 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 16 Obs = 0 0 0 0 0 0 0 0
Year 16 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 17 Obs = 0 0 0 0 0 0 0 0
Year 17 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 18 Obs = 0 0 0 0 0 0 0 0
Year 18 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 19 Obs = 0 0 0 0 0 0 0 0
Year 19 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15

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Year 20 Obs = 0 0 0 0 0 0 0 0
Year 20 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 21 Obs = 0 0 0 0 0 0 0 0
Year 21 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 22 Obs = 0 0 0 0 0 0 0 0
Year 22 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 23 Obs = 0 0 0 0 0 0 0 0
Year 23 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 24 Obs = 0 0 0 0 0 0 0 0
Year 24 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 25 Obs = 0 0 0 0 0 0 0 0
Year 25 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
fleet 4
Year 1 Obs = 0 0 0 0 0 0 0 0
Year 1 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 2 Obs = 0 0 0 0 0 0 0 0
Year 2 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 3 Obs = 0 0 0 0 0 0 0 0
Year 3 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 4 Obs = 0 0 0 0 0 0 0 0
Year 4 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 5 Obs = 0 0 0 0 0 0 0 0
Year 5 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 6 Obs = 0 0 0 0 0 0 0 0
Year 6 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 7 Obs = 0 0 0 0 0 0 0 0
Year 7 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 8 Obs = 0 0 0 0 0 0 0 0
Year 8 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 9 Obs = 0 0 0 0 0 0 0 0
Year 9 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 10 Obs = 0 0 0 0 0 0 0 0
Year 10 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 11 Obs = 0 0 0 0 0 0 0 0
Year 11 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 12 Obs = 0 0 0 0 0 0 0 0
Year 12 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 13 Obs = 0 0 0 0 0 0 0 0
Year 13 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 14 Obs = 0 0 0 0 0 0 0 0
Year 14 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 15 Obs = 0 0 0 0 0 0 0 0
Year 15 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 16 Obs = 0 0 0 0 0 0 0 0
Year 16 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 17 Obs = 0 0 0 0 0 0 0 0
Year 17 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 18 Obs = 0 0 0 0 0 0 0 0
Year 18 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 19 Obs = 0 0 0 0 0 0 0 0
Year 19 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 20 Obs = 0 0 0 0 0 0 0 0
Year 20 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 21 Obs = 0 0 0 0 0 0 0 0
Year 21 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 22 Obs = 0 0 0 0 0 0 0 0
Year 22 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15

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Year 23 Obs = 0 0 0 0 0 0 0 0
Year 23 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 24 Obs = 0 0 0 0 0 0 0 0
Year 24 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 25 Obs = 0 0 0 0 0 0 0 0
Year 25 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
fleet 5
Year 1 Obs = 0 0 0 0 0 0 0 0
Year 1 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 2 Obs = 0 0 0 0 0 0 0 0
Year 2 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 3 Obs = 0 0 0 0 0 0 0 0
Year 3 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 4 Obs = 0 0 0 0 0 0 0 0
Year 4 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 5 Obs = 0 0 0 0 0 0 0 0
Year 5 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 6 Obs = 0 0 0 0 0 0 0 0
Year 6 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 7 Obs = 0 0 0 0 0 0 0 0
Year 7 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 8 Obs = 0 0 0 0 0 0 0 0
Year 8 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 9 Obs = 0 0 0 0 0 0 0 0
Year 9 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 10 Obs = 0 0 0 0 0 0 0 0
Year 10 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 11 Obs = 0 0 0 0 0 0 0 0
Year 11 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 12 Obs = 0 0 0 0 0 0 0 0
Year 12 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 13 Obs = 0 0 0 0 0 0 0 0
Year 13 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 14 Obs = 0 0 0 0 0 0 0 0
Year 14 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 15 Obs = 0 0 0 0 0 0 0 0
Year 15 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 16 Obs = 0 0 0 0 0 0 0 0
Year 16 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 17 Obs = 0 0 0 0 0 0 0 0
Year 17 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 18 Obs = 0 0 0 0 0 0 0 0
Year 18 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 19 Obs = 0 0 0 0 0 0 0 0
Year 19 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 20 Obs = 0 0 0 0 0 0 0 0
Year 20 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 21 Obs = 0 0 0 0 0 0 0 0
Year 21 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 22 Obs = 0 0 0 0 0 0 0 0
Year 22 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 23 Obs = 0 0 0 0 0 0 0 0
Year 23 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 24 Obs = 0 0 0 0 0 0 0 0
Year 24 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 25 Obs = 0 0 0 0 0 0 0 0
Year 25 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15

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fleet 6
Year 1 Obs = 0 0 0 0 0 0 0 0
Year 1 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 2 Obs = 0 0 0 0 0 0 0 0
Year 2 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 3 Obs = 0 0 0 0 0 0 0 0
Year 3 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 4 Obs = 0 0 0 0 0 0 0 0
Year 4 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 5 Obs = 0 0 0 0 0 0 0 0
Year 5 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 6 Obs = 0 0 0 0 0 0 0 0
Year 6 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 7 Obs = 0 0 0 0 0 0 0 0
Year 7 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 8 Obs = 0 0 0 0 0 0 0 0
Year 8 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 9 Obs = 0 0 0 0 0 0 0 0
Year 9 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 10 Obs = 0 0 0 0 0 0 0 0
Year 10 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 11 Obs = 0 0 0 0 0 0 0 0
Year 11 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 12 Obs = 0 0 0 0 0 0 0 0
Year 12 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 13 Obs = 0 0 0 0 0 0 0 0
Year 13 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 14 Obs = 0 0 0 0 0 0 0 0
Year 14 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 15 Obs = 0 0 0 0 0 0 0 0
Year 15 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 16 Obs = 0 0 0 0 0 0 0 0
Year 16 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 17 Obs = 0 0 0 0 0 0 0 0
Year 17 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 18 Obs = 0 0 0 0 0 0 0 0
Year 18 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 19 Obs = 0 0 0 0 0 0 0 0
Year 19 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 20 Obs = 0 0 0 0 0 0 0 0
Year 20 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 21 Obs = 0 0 0 0 0 0 0 0
Year 21 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 22 Obs = 0 0 0 0 0 0 0 0
Year 22 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 23 Obs = 0 0 0 0 0 0 0 0
Year 23 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 24 Obs = 0 0 0 0 0 0 0 0
Year 24 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 25 Obs = 0 0 0 0 0 0 0 0
Year 25 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15

```

F Reference Points Using Final Year Selectivity and Freport options

refpt	F	slope to plot on SRR
F0.1	0.152881	0.319245
Fmax	0.279128	0.516866
F30%SPR	0.229528	0.436022

F40%SPR	0.158236	0.327007			
Fmsy	0.186241	0.368634	SSBmsy	6.51841e+25	MSY
1.14189e+25					
Fcurrent	0.549344	0.981741			

Stock-Recruitment Relationship Parameters

alpha = 2.93159e+25  
 beta = 1.43419e+25  
 unexpl = 2.23067e+26  
 steepness = 0.805387

Spawning Stock, Obs Recruits(year+1), Pred Recruits(year+1), standardized residual

init	xxxx	97062.2	15698.8	3.85656	
1982		15299.5	103590	31273.5	2.53539
1983		20232.5	29010.2	41356.9	-0.750651
1984		17910.5	56267.3	36610.4	0.909817
1985		12866.4	78406	26299.9	2.3124
1986		14397.4	10996.4	29429.5	-2.08397
1987		12863.5	50266.8	26294	1.37179
1988		7234.02	22469	14786.9	0.885709
1989		7950.32	29309.9	16251.1	1.2485
1990		9597.1	18141.7	19617.2	-0.165538
1991		6721.31	56335.6	13738.9	2.9872
1992		6674.25	32501.5	13642.7	1.83768
1993		11836.1	37381.4	24193.9	0.921021
1994		14637.2	41145.4	29919.6	0.674452
1995		18578.8	29040.8	37976.5	-0.567898
1996		20634.6	27793.1	42178.8	-0.883041
1997		21338.4	34351	43617.4	-0.505576
1998		23304.3	25643.4	47635.8	-1.31102
1999		24300.2	30997	49671.5	-0.998224
2000		25984.9	28222.5	53115.3	-1.33864
2001		30300	30073.3	61935.6	-1.5294
2002		33479	17902	68433.7	-2.83872
2003		35553.7	28339.4	72674.7	-1.9936
2004		31562.3	13577.9	64515.8	-3.29917
2005		27021.8	30243.3	55234.7	-1.27507
2006		24936	xxxx	50971.2	

Root Mean Square Error computed from Standardized Residuals

Component	#resids	RMSE
_Catch_Fleet_1	25	0.725723
_Catch_Fleet_2	25	0.227321
_Catch_Fleet_3	25	3.18695
_Catch_Fleet_4	25	2.11043
_Catch_Fleet_5	25	0.287387
_Catch_Fleet_6	25	0.0438207
Catch_Fleet_Total	150	1.59548
_Discard_Fleet_1	0	0
_Discard_Fleet_2	0	0
_Discard_Fleet_3	0	0
_Discard_Fleet_4	0	0
_Discard_Fleet_5	0	0
_Discard_Fleet_6	0	0
Discard_Fleet_Total	0	0
_Index_1	15	2.63899
_Index_2	15	2.75352

_Index_3	15	2.90266
_Index_4	15	2.97054
_Index_5	14	1.71904
_Index_6	25	3.77745
_Index_7	25	4.51911
_Index_8	24	4.55728
_Index_9	20	5.06911
_Index_10	15	1.98099
_Index_11	24	2.55692
_Index_12	24	3.02387
_Index_13	22	2.9767
_Index_14	25	3.51974
_Index_15	25	3.28889
_Index_16	24	3.36338
_Index_17	22	3.94782
_Index_18	23	1.51235
_Index_19	23	2.29602
_Index_20	22	2.98137
_Index_21	22	2.14156
_Index_22	22	1.5502
_Index_23	22	2.35926
_Index_24	22	1.48266
_Index_25	25	3.42895
_Index_26	20	3.75802
_Index_27	17	1.62819
_Index_28	17	1.76583
_Index_29	19	1.45328
_Index_30	19	1.77833
_Index_31	16	1.68215
_Index_32	15	1.76458
_Index_33	19	2.02468
_Index_34	25	1.09348
_Index_35	25	1.37439
_Index_36	19	1.49039
_Index_37	25	1.33349
_Index_38	21	1.98413
_Index_39	15	1.64904
Index_Total	802	2.76882
Nyear1	7	4.12008
Fmult_Year1	6	8.9986
_Fmult_devs_Fleet_1	0	0
_Fmult_devs_Fleet_2	0	0
_Fmult_devs_Fleet_3	0	0
_Fmult_devs_Fleet_4	0	0
_Fmult_devs_Fleet_5	0	0
_Fmult_devs_Fleet_6	0	0
Fmult_devs_Total	0	0
Recruit_devs	0	0
Fleet_Sel_params	32	6.12623
Index_Sel_params	0	0
q_year1	0	0
q_devs	0	0
SRR_steepness	0	0
SRR_unexpl_S	0	0

Projections not requested

that's all

## ASAP ALTERNATIVE RUN (F08 SVAge comp.REP)

Age Structured Assessment Program (ASAP) Version 2.0  
Start time for run: Fri Mar 28 11:36:11 2008

obj\_fun = 28952.5

Component	Lambda	obj_fun
__Catch_Fleet_1	10	2064.51
Catch_Fleet_Total	10	2064.51
Discard_Fleet_Total	0	0
__Index_Fit_1	1	92.1493
__Index_Fit_2	1	46.612
__Index_Fit_3	1	35.2325
__Index_Fit_4	1	114.635
__Index_Fit_5	1	161.785
__Index_Fit_6	1	6.96195
__Index_Fit_7	1	33.4007
__Index_Fit_8	1	41.3422
__Index_Fit_9	1	29.1583
__Index_Fit_10	1	47.2661
__Index_Fit_11	1	14.3711
__Index_Fit_12	1	79.8653
__Index_Fit_13	1	27.0557
Index_Fit_Total	13	729.835
Catch_Age_Comps	see_below	374.972
Discard_Age_Comps	see_below	0
Survey_Age_Comps	see_below	25688.1
__Sel_Param_1	1	0.865894
__Sel_Param_2	1	3.68963
__Sel_Param_3	1	1.0393
__Sel_Param_4	1	2.34366
Sel_Params_Total	4	7.93848
__Index_Sel_Param_1	1	0.943825
__Index_Sel_Param_2	1	1.1233
__Index_Sel_Param_3	1	0.907767
__Index_Sel_Param_4	1	1.99006
__Index_Sel_Param_5	1	0.199202
__Index_Sel_Param_6	1	6.51157
__Index_Sel_Param_9	1	0.461552
__Index_Sel_Param_10	1	0.168969
__Index_Sel_Param_17	1	0.168969
__Index_Sel_Param_18	1	0.486765
__Index_Sel_Param_25	1	0.696264
__Index_Sel_Param_26	1	0.323948
__Index_Sel_Param_27	1	0.168969
__Index_Sel_Param_31	1	0.889978
__Index_Sel_Param_32	1	3.65449
__Index_Sel_Param_35	1	0.168969
__Index_Sel_Param_36	1	0.668816
__Index_Sel_Param_41	1	0.885887
__Index_Sel_Param_42	1	1.93495
__Index_Sel_Param_43	1	2.55251
Index_Sel_Params_Total	20	24.9068
q_year1_Total	0	0
q_devs_Total	130000	0



__Fmult_year1_fleet_1	1	0.658164
Fmult_year1_fleet_Total	1	0.658164
Fmult_devs_fleet_Total	0	0
N_year_1	1	61.573
Recruit_devs	0	0
SRR_steepness	0	0
SRR_unexpl_stock	0	0
Fmult_Max_penalty	1000	0
F_penalty	0	0

Input and Estimated effective sample sizes for fleet 1

1982	31	23.5065
1983	33	24.0389
1984	43	13.3083
1985	379	170.647
1986	39	8.22219
1987	46	22.2347
1988	663	101.747
1989	92	332.309
1990	2270	117.262
1991	58	12.9326
1992	173	79.6955
1993	415	65.9631
1994	106	50.6206
1995	75	39.4668
1996	222	76.4549
1997	267	49.0351
1998	151	177.214
1999	187	281.54
2000	125	223.883
2001	215	203.151
2002	61	54.7536
2003	236	135.97
2004	139	172.464
2005	368	193.59
2006	194	98.8826
Total	6588	2728.89

Input and Estimated effective Discard sample sizes for fleet 1

1982	0	1e+15
1983	0	1e+15
1984	0	1e+15
1985	0	1e+15
1986	0	1e+15
1987	0	1e+15
1988	0	1e+15
1989	0	1e+15
1990	0	1e+15
1991	0	1e+15
1992	0	1e+15
1993	0	1e+15
1994	0	1e+15
1995	0	1e+15
1996	0	1e+15
1997	0	1e+15
1998	0	1e+15
1999	0	1e+15

2000	0	1e+15
2001	0	1e+15
2002	0	1e+15
2003	0	1e+15
2004	0	1e+15
2005	0	1e+15
2006	0	1e+15
Total	0	2.5e+16

Observed and predicted total fleet catch by year and standardized residual  
fleet 1 total catches

1982	18963	19195.4	-0.122109
1983	26466	25384.5	0.418271
1984	26057	24981.1	0.422708
1985	20432	19975.4	0.226549
1986	20866	21116.4	-0.119568
1987	18312	18546.2	-0.127383
1988	21761	20876.8	0.41585
1989	10314	9091.06	1.26525
1990	7976	7506.94	0.607599
1991	11316	10926.1	0.351494
1992	11805	12213.1	-0.340726
1993	10781	11630.2	-0.760129
1994	12182	11615.4	0.477441
1995	10495	9694.19	0.795698
1996	11643	12176.9	-0.449456
1997	10325	11128.2	-0.750974
1998	11641	12038.1	-0.336266
1999	10851	11082	-0.211188
2000	13756	14265.1	-0.364303
2001	11932	12220.1	-0.239148
2002	11308	11778.5	-0.40871
2003	12927	13369.7	-0.337545
2004	13832	14125	-0.210103
2005	13444	13611.2	-0.123878
2006	12853	12852.4	0.000429028

Observed and predicted total fleet Discards by year and standardized residual  
fleet 1 total Discards

1982	0	0	0
1983	0	0	0
1984	0	0	0
1985	0	0	0
1986	0	0	0
1987	0	0	0
1988	0	0	0
1989	0	0	0
1990	0	0	0
1991	0	0	0
1992	0	0	0
1993	0	0	0
1994	0	0	0
1995	0	0	0
1996	0	0	0
1997	0	0	0
1998	0	0	0
1999	0	0	0
2000	0	0	0

2001 0 0 0  
2002 0 0 0  
2003 0 0 0  
2004 0 0 0  
2005 0 0 0  
2006 0 0 0

Index data

index number 1

units = 2

month = 1

starting and ending ages for selectivity = 2 8

selectivity choice = -1

year, obs index, pred index, standardized residual

1992 12.3 7.54009 3.07796  
1993 13.6 7.5266 3.72116  
1994 12.05 7.94022 2.62358  
1995 10.93 9.75436 0.715749  
1996 31.25 15.3005 4.49167  
1997 10.28 17.1287 -3.21123  
1998 7.76 17.7966 -5.22063  
1999 11.06 18.139 -3.11172  
2000 15.77 18.2803 -0.929082  
2001 18.6 17.2825 0.462099  
2002 22.68 19.1877 1.05174  
2003 35.64 21.965 3.04432  
2004 17.77 23.1879 -1.67382  
2005 12.89 24.5117 -4.04237  
2006 21.06 24.687 -0.999438

index number 2

units = 2

month = 1

starting and ending ages for selectivity = 2 8

selectivity choice = -1

year, obs index, pred index, standardized residual

1982 2.27 1.91575 0.816747  
1983 0.95 1.93498 -3.42444  
1984 0.66 1.95525 -5.22789  
1985 2.38 1.53323 2.11673  
1986 2.14 1.3136 2.34926  
1987 0.93 1.40755 -1.99492  
1988 1.5 1.4356 0.211244  
1989 0.32 0.645859 -3.3805  
1990 0.72 0.486179 1.89024  
1991 1.08 0.748915 1.76227  
1992 1.2 0.763812 2.17463  
1993 1.27 0.759139 2.47709  
1994 0.93 0.804313 0.698939  
1995 1.09 0.983287 0.495969  
1996 1.76 1.5628 0.572031  
1997 1.06 1.75865 -2.4371  
1998 1.19 1.79967 -1.9912  
1999 1.6 1.82963 -0.645577  
2000 2.14 1.84582 0.71187  
2001 2.69 1.73105 2.12197  
2002 2.47 1.93159 1.18358  
2003 2.91 2.20818 1.32851

```

2004  3.03  2.33121  1.26204
2005  1.81  2.43755  -1.43288
2006  1.77  2.48776  -1.63861
index number 3
units = 2
month = 1
starting and ending ages for selectivity = 1 5
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982  2.5  2.83958  -0.42046
1983  2.89  3.134  -0.267579
1984  2.08  3.09466  -1.31161
1985  1.9  2.32043  -0.659919
1986  1.44  2.56687  -1.90826
1987  0.9  2.50345  -3.37727
1988  0.89  1.90144  -2.50611
1989  0.57  0.889314  -1.46844
1990  0.89  1.12052  -0.760373
1991  1.7  1.45783  0.507342
1992  2.32  1.41421  1.6341
1993  1.07  1.41529  -0.923279
1994  1.53  1.52757  0.00525775
1995  2.4  1.8926  0.784102
1996  1.96  2.29038  -0.514251
1997  2.91  2.16618  0.974491
1998  4.51  2.1654  2.42209
1999  3.78  2.10084  1.93911
2000  3.19  2.01919  1.50973
2001  2.89  2.06634  1.10749
2002  2.55  2.28008  0.369349
2003  2.87  2.3916  0.60198
2004  4.07  2.48299  1.6314
2005  2.49  2.54735  -0.0751662
2006  2.77  2.23649  0.706268
index number 4
units = 2
month = 1
starting and ending ages for selectivity = 3 4
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982  1.726  1.24583  1.56931
1983  1.049  1.38311  -1.33097
1984  0.145  0.930165  -8.94696
1985  1.296  1.15572  0.551437
1986  0.707  0.607022  0.73393
1987  0.653  0.674727  -0.157559
1988  1.128  0.909554  1.03615
1989  0.465  0.563767  -0.927141
1990  0.102  0.19859  -3.20725
1991  0.062  0.306259  -7.68898
1992  0.432  0.404173  0.320513
1993  0.557  0.374742  1.90782
1994  1.265  0.446179  5.01644
1995  1.355  0.503381  4.76661
1996  0.8  1.00688  -1.10716
1997  1.46  1.46212  -0.0069917
1998  1.871  1.50234  1.05636

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1999  1.99  1.36515  1.81417
2000  2.864  1.46892  3.21411
2001  1.756  1.24145  1.66919
2002  1.908  1.35371  1.65211
2003  2.064  1.62709  1.14496
2004  0.606  1.80873  -5.26384
2005  1.38  1.61231  -0.748946
2006  3.415  1.85697  2.93268
index number 5
units = 2
month = 1
starting and ending ages for selectivity = 3 4
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982  1.682  1.1546  1.81109
1983  0.779  1.11461  -1.72453
1984  0.394  0.783503  -3.30908
1985  1.935  1.05004  2.94253
1986  0.893  0.481363  2.97472
1987  0.674  0.627016  0.347831
1988  0.435  0.811326  -3.00052
1989  0.333  0.490955  -1.86874
1990  0.011  0.147002  -12.4799
1991  0.294  0.288147  0.0968051
1992  0.186  0.371367  -3.32844
1993  0.508  0.334744  2.00789
1994  0.076  0.401853  -8.01658
1995  0.506  0.440068  0.672034
1996  1.396  0.931751  1.9462
1997  1.859  1.26955  1.83583
1998  0.852  1.141  -1.40596
1999  1.319  1.07479  0.985626
2000  2.797  1.15028  4.27722
2001  1.39  0.926286  1.95379
2002  1.48  1.08518  1.49369
2003  1.51  1.25529  0.889314
2004  1.591  1.38718  0.659915
2005  3.399  1.15449  5.19801
2006  4.304  1.51026  5.04126
index number 6
units = 2
month = 1
starting and ending ages for selectivity = 3 5
selectivity choice = -1
  year, obs index, pred index, standardized residual
1984  0.315  0.418658  -0.738427
1985  0.423  0.494647  -0.406154
1986  0.19  0.253925  -0.752793
1987  0.104  0.291746  -2.67744
1988  0.267  0.377594  -0.89959
1989  0.089  0.237528  -2.54806
1990  0.041  0.0863973  -1.93479
1991  0.246  0.134117  1.5746
1992  0.213  0.167657  0.621342
1993  0.184  0.156116  0.42657
1994  0.357  0.187551  1.6708
1995  0.076  0.21128  -2.65398

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1996  0.375  0.420964  -0.300115
1997  0.6  0.602624  -0.0113271
1998  1.213  0.641634  1.65303
1999  1.117  0.649477  1.40748
2000  1.324  0.680338  1.72827
2001  0.825  0.586594  0.885264
2002  1.962  0.655437  2.84596
2003  1.643  0.749426  2.03755
2004  1.422  0.870724  1.27317
2005  0.447  0.806745  -1.53263
2006  0.493  0.937668  -1.66874
index number 7
units = 2
month = 1
starting and ending ages for selectivity = 1 8
selectivity choice = -1
  year, obs index, pred index, standardized residual
1984  0.999  2.28158  -2.1437
1985  1.191  1.60968  -0.781933
1986  1.719  1.64716  0.110808
1987  1.401  1.70786  -0.514095
1988  1.42  1.53774  -0.206768
1989  0.14  0.633396  -3.91808
1990  0.87  0.649399  0.759102
1991  1.26  0.952706  0.725654
1992  1.02  0.927476  0.246827
1993  1.109  0.933631  0.446805
1994  0.55  0.97366  -1.48252
1995  0.541  1.2111  -2.09179
1996  2.191  1.71041  0.642762
1997  2.5  1.71748  0.97451
1998  1.719  1.71488  0.00622259
1999  2.68  1.72983  1.13637
2000  1.91  1.68011  0.332875
2001  4.417  1.65216  2.55254
2002  6.121  1.84153  3.11777
2003  3.388  2.05019  1.30384
2004  1.954  2.08166  -0.164273
2005  2.41  2.24897  0.179503
2006  1.316  2.11573  -1.23244
index number 8
units = 2
month = 1
starting and ending ages for selectivity = 3 4
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982  0.59  0.828087  -0.87993
1983  0.53  0.788703  -1.03182
1984  0.59  0.556906  0.149842
1985  0.3  0.751753  -2.38447
1986  0.64  0.340038  1.64155
1987  0.39  0.44981  -0.370352
1988  0.24  0.579866  -2.28981
1989  0.07  0.350098  -4.17834
1990  0.12  0.103059  0.395037
1991  0.09  0.206938  -2.1612
1992  0.52  0.266142  1.73859

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1993  0.29  0.239277  0.499042
1994  0.03  0.287466 -5.86603
1995  0.2   0.313927 -1.17025
1996  1.04  0.668171  1.14842
1997  0.99  0.905061  0.232841
1998  0.45  0.802239 -1.50073
1999  2.26  0.758655  2.83339
2000  1.69  0.811475  1.90428
2001  0.93  0.64998  0.929889
2002  1.78  0.767453  2.18374
2003  2.57  0.884125  2.76977
2004  2.08  0.976386  1.96303
2005  2.07  0.806251  2.4475
2006  1.57  1.06968  0.996014
index number 9
units = 2
month = 1
starting and ending ages for selectivity = 1 8
selectivity choice = -1
  year, obs index, pred index, standardized residual
1990  0.29  0.27472  0.140505
1991  0.15  0.397241 -2.52797
1992  0.34  0.402362 -0.437131
1993  0.26  0.399074 -1.11216
1994  0.17  0.428745 -2.40118
1995  0.08  0.524055 -4.87879
1996  0.96  0.773908  0.559322
1997  0.73  0.847535 -0.387505
1998  0.43  0.863277 -1.80907
1999  0.9   0.868505  0.0924629
2000  2.61  0.876343  2.83281
2001  0.98  0.832595  0.423112
2002  2.03  0.928122  2.03146
2003  3.78  1.04224  3.34417
2004  2.17  1.10641  1.74848
2005  2.49  1.14161  2.02424
2006  1.32  1.15027  0.357257
index number 10
units = 2
month = 1
starting and ending ages for selectivity = 1 8
selectivity choice = -1
  year, obs index, pred index, standardized residual
1988  4.26  6.23688 -0.989507
1989  1.69  3.64041 -1.99185
1990  2.86  4.60006 -1.2336
1991  3.97  5.46561 -0.82987
1992  4.75  5.43199 -0.348242
1993  8.46  5.3459  1.19148
1994  2.83  6.04261 -1.96899
1995  8.37  7.37571  0.328257
1996  9.69  8.17946  0.439888
1997  16.35  7.95322  1.87059
1998  9.47  8.05435  0.420285
1999  11.44  7.64338  1.04678
2000  7.35  7.79363 -0.152124
2001  5.68  7.95066 -0.872944

```

```

2002 16.84 8.77206 1.69287
2003 9.84 8.92621 0.252986
2004 10.66 9.91036 0.189271
2005 11.19 9.42065 0.446761
2006 10.65 8.75713 0.507956
index number 11
units = 2
month = 1
starting and ending ages for selectivity = 1 1
selectivity choice = -1
year, obs index, pred index, standardized residual
1986 0.32 0.321593 -0.0128915
1987 0.26 0.247873 0.123988
1988 0.01 0.0517732 -4.26807
1989 0.14 0.126369 0.265899
1990 0.36 0.188631 1.67763
1991 0.38 0.164607 2.17159
1992 0.37 0.174796 1.94647
1993 0.05 0.16301 -3.06756
1994 0.57 0.214904 2.53196
1995 0.3 0.25164 0.456276
1996 0.08 0.170399 -1.96264
1997 0.22 0.166241 0.727278
1998 0.39 0.172739 2.11384
1999 0.35 0.130116 2.56846
2000 0.21 0.166588 0.601119
2001 0.14 0.179157 -0.640156
2002 0.13 0.194362 -1.04395
2003 0.21 0.143261 0.992688
2004 0.27 0.230624 0.40917
2005 0.01 0.117019 -6.38476
2006 0.17 0.125215 0.793671
index number 12
units = 2
month = 1
starting and ending ages for selectivity = 1 1
selectivity choice = -1
year, obs index, pred index, standardized residual
1982 3.408 12.1543 -3.30058
1983 17.699 19.3591 -0.232713
1984 13.31 7.97112 1.33079
1985 12.843 14.1176 -0.245609
1986 59.526 14.3118 3.69972
1987 7.584 11.031 -0.972531
1988 1.763 2.30405 -0.694743
1989 2.855 5.62376 -1.7597
1990 4.733 8.39461 -1.48741
1991 7.337 7.32547 0.00408205
1992 8.487 7.7789 0.226139
1993 4.145 7.2544 -1.45283
1994 22.311 9.56384 2.19879
1995 13.067 11.1987 0.400496
1996 6.493 7.58322 -0.402886
1997 7.997 7.39821 0.202019
1998 14.983 7.68738 1.7322
1999 8.565 5.79051 1.01612
2000 9.874 7.41364 0.743885

```



```

2001 13.543 7.973 1.37522
2002 5.406 8.64963 -1.22
2003 8.18 6.37553 0.64691
2004 6.993 10.2634 -0.995903
2005 2.198 5.20765 -2.239
2006 9.658 5.57243 1.42752
index number 13
units = 2
month = 1
starting and ending ages for selectivity = 1 1
selectivity choice = -1
year, obs index, pred index, standardized residual
1982 2.27 1.43516 1.19013
1983 5.01 2.28589 2.03679
1984 1.58 0.94122 1.34458
1985 1.26 1.66699 -0.726548
1986 1.26 1.68992 -0.762014
1987 0.39 1.30253 -3.13019
1988 0.54 0.272059 1.77948
1989 1.24 0.664046 1.62105
1990 2.54 0.991224 2.44249
1991 2.64 0.864982 2.89634
1992 0.89 0.918522 -0.0818803
1993 0.5 0.85659 -1.3974
1994 2.41 1.12929 1.96765
1995 0.63 1.32233 -1.92452
1996 0.81 0.895417 -0.260231
1997 0.89 0.873571 0.0483633
1998 0.73 0.907716 -0.565568
1999 0.53 0.683736 -0.66111
2000 0.57 0.875393 -1.11365
2001 0.47 0.941442 -1.80318
2002 0.77 1.02134 -0.733226
2003 0.44 0.752815 -1.394
2004 1.3 1.21189 0.182176
2005 0.35 0.614913 -1.4628
2006 0.8 0.657985 0.507276

```

Input and Estimated effective sample sizes for index 1

```

1992 100 118.621
1993 100 21.273
1994 100 8.3919
1995 100 70.7126
1996 100 3.73205
1997 100 17.5172
1998 100 955.085
1999 100 129.711
2000 100 24.3779
2001 100 41.3227
2002 100 33.9329
2003 100 1118.94
2004 100 49.8274
2005 100 230.662
2006 100 718.924

```

Total 1500 3543.03

Input and Estimated effective sample sizes for index 2

```

1982 200 51.6129

```

1983	200	492.46
1984	200	5.42513
1985	200	111.26
1986	200	28.2404
1987	200	107.991
1988	200	131.313
1989	200	39.8793
1990	200	5.71901
1991	200	18.3413
1992	200	19.4127
1993	200	225.433
1994	200	19.172
1995	200	9.31537
1996	200	5.83828
1997	200	106.614
1998	200	2745.17
1999	200	39.8192
2000	200	50.9268
2001	200	34.6435
2002	200	27.118
2003	200	176.445
2004	200	88.7468
2005	200	44.076
2006	200	26.6085
Total	5000	4611.59

Input and Estimated effective sample sizes for index 3

1982	200	22.494
1983	200	39.9825
1984	200	124.415
1985	200	93.8825
1986	200	286.114
1987	200	25.506
1988	200	43.8008
1989	200	4.95657
1990	200	18.8502
1991	200	8.51814
1992	200	14.4996
1993	200	12.6568
1994	200	11.4063
1995	200	37.2978
1996	200	31.7089
1997	200	45.8043
1998	200	25.3096
1999	200	30.619
2000	200	39.2675
2001	200	21.8385
2002	200	21.2653
2003	200	47.0809
2004	200	38.8658
2005	200	401.613
2006	200	222.287

Total 5000 1670.04

Input and Estimated effective sample sizes for index 4

1982	100	107.977
1983	100	34.2916
1984	100	5.83164
1985	100	8.77213

1986	100	19.0612
1987	100	12.5322
1988	100	29.2407
1989	100	34607.8
1990	100	2.45753
1991	100	6.54163
1992	100	17.3549
1993	100	39.7699
1994	100	8.7098
1995	100	5.46338
1996	100	132.138
1997	100	16.7582
1998	100	33.3017
1999	100	7.7066
2000	100	284.199
2001	100	108.154
2002	100	10.4753
2003	100	19.1446
2004	100	20.3479
2005	100	4.99488
2006	100	99.5416
Total	2500	35642.6

Input and Estimated effective sample sizes for index 5

1982	100	26.4813
1983	100	6301.02
1984	100	4.66732
1985	100	22.8855
1986	100	490.263
1987	100	34.8278
1988	100	13.1016
1989	100	20.5499
1990	100	0.433317
1991	100	80.3202
1992	100	14.2691
1993	100	70.9197
1994	100	10.7228
1995	100	7.65234
1996	100	100.16
1997	100	24.4156
1998	100	147.934
1999	100	53.4174
2000	100	52.3684
2001	100	40.2889
2002	100	20.8741
2003	100	27.4651
2004	100	6.28849
2005	100	78.6932
2006	100	39.3887

Total 2500 7689.41

Input and Estimated effective sample sizes for index 6

1984	100	9.13474
1985	100	20.5963
1986	100	22.8604
1987	100	73.253
1988	100	265.783
1989	100	4.79719
1990	100	58.9697

1991	100	13.6972
1992	100	759.943
1993	100	25.6803
1994	100	36.2781
1995	100	18.1394
1996	100	4.18949
1997	100	20.8085
1998	100	95.9122
1999	100	132.763
2000	100	37.8285
2001	100	53.1015
2002	100	49.1044
2003	100	38.8114
2004	100	72.3484
2005	100	10.7314
2006	100	12.4136
Total	2300	1837.14

Input and Estimated effective sample sizes for index 7

1984	100	23.5731
1985	100	24.5881
1986	100	295.131
1987	100	20.4856
1988	100	98.9566
1989	100	17.2652
1990	100	28.0577
1991	100	93.5366
1992	100	44.9739
1993	100	22.3697
1994	100	13.7288
1995	100	47.3238
1996	100	14.6902
1997	100	46.4665
1998	100	6.9553
1999	100	14.1178
2000	100	77.6051
2001	100	10.2087
2002	100	22.811
2003	100	53.259
2004	100	54.7589
2005	100	48.8162
2006	100	132.062

Total 2300 1211.74

Input and Estimated effective sample sizes for index 8

1982	100	11.0587
1983	100	382.381
1984	100	174.553
1985	100	6823.36
1986	100	33599.3
1987	100	29080.3
1988	100	10.4817
1989	100	8.10245
1990	100	2.53957
1991	100	7.14768
1992	100	2.43217
1993	100	3.2546
1994	100	11.7998
1995	100	8.42092

1996	100	26.7721
1997	100	14.6238
1998	100	67.447
1999	100	49.8549
2000	100	76.8843
2001	100	80.2997
2002	100	158.454
2003	100	91.7159
2004	100	10.3535
2005	100	1880.05
2006	100	14.2005

Total 2500 72595.8

Input and Estimated effective sample sizes for index 9

1990	100	61.7963
1991	100	7.81849
1992	100	46.9289
1993	100	25.0137
1994	100	15.7169
1995	100	4.25525
1996	100	42.3328
1997	100	124.66
1998	100	22.7039
1999	100	311.244
2000	100	117.854
2001	100	18.2379
2002	100	21.649
2003	100	21.733
2004	100	79.7948
2005	100	49.0442
2006	100	44.3416

Total 1700 1015.12

Input and Estimated effective sample sizes for index 10

1988	100	15.9629
1989	100	9.63008
1990	100	27.4182
1991	100	9.8401
1992	100	7.73236
1993	100	8.41824
1994	100	19.669
1995	100	16.654
1996	100	40.1803
1997	100	10.6752
1998	100	4.79342
1999	100	11.8347
2000	100	7.16788
2001	100	6.8386
2002	100	7.87276
2003	100	8.6866
2004	100	3.80159
2005	100	11.1216
2006	100	5.62824

Total 1900 233.926

Input and Estimated effective sample sizes for index 11

1986	0	0
1987	0	0
1988	0	0
1989	0	0

1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 12

1982 0 0  
1983 0 0  
1984 0 0  
1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 13

1982 0 0  
1983 0 0  
1984 0 0  
1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0

1993 0 0  
 1994 0 0  
 1995 0 0  
 1996 0 0  
 1997 0 0  
 1998 0 0  
 1999 0 0  
 2000 0 0  
 2001 0 0  
 2002 0 0  
 2003 0 0  
 2004 0 0  
 2005 0 0  
 2006 0 0  
 Total 0 0

Survey proportions at age by index

Index number 1

Year 1992 Obs = -1 0.581582 0.385385 0.027027 0.003003 0.001001 0.002002 0  
 Year 1992 Pred = -1 0.526066 0.414236 0.0536325 0.00346755 0.00212635  
 0.000405328 6.63787e-05  
 Year 1993 Obs = -1 0.478 0.493 0.023 0.004 0.001 0.001 0  
 Year 1993 Pred = -1 0.56015 0.36281 0.0692043 0.00706614 0.000441028  
 0.000269053 5.96403e-05  
 Year 1994 Obs = -1 0.311688 0.597403 0.0679321 0.021978 0 0 0.000999001  
 Year 1994 Pred = -1 0.499552 0.416628 0.0717824 0.0108515 0.00106977  
 6.6426e-05 4.94682e-05  
 Year 1995 Obs = -1 0.555 0.42 0.023 0.002 0 0 0  
 Year 1995 Pred = -1 0.540384 0.359103 0.0866966 0.0118912 0.00173584  
 0.000170247 1.84288e-05  
 Year 1996 Obs = -1 0.709 0.267 0.019 0.004 0.001 0 0  
 Year 1996 Pred = -1 0.416511 0.515979 0.0592757 0.00718042 0.000908248  
 0.00013147 1.42758e-05  
 Year 1997 Obs = -1 0.375 0.467 0.101 0.042 0.011 0.004 0  
 Year 1997 Pred = -1 0.252928 0.585266 0.151113 0.00947107 0.00106652  
 0.000133847 2.14578e-05  
 Year 1998 Obs = -1 0.216216 0.419419 0.295295 0.0540541 0.013013 0.001001  
 0.001001  
 Year 1998 Pred = -1 0.23927 0.420389 0.289355 0.0477964 0.0028274  
 0.000316232 4.60082e-05  
 Year 1999 Obs = -1 0.191191 0.434434 0.262262 0.0760761 0.025025 0.00500501  
 0.00600601  
 Year 1999 Pred = -1 0.244192 0.4109 0.22607 0.101867 0.0159164 0.000935299  
 0.000119724  
 Year 2000 Obs = -1 0.044044 0.413413 0.315315 0.159159 0.049049 0.011011  
 0.00800801  
 Year 2000 Pred = -1 0.182813 0.432864 0.246545 0.0919479 0.0393207 0.0061045  
 0.000404293  
 Year 2001 Obs = -1 0.165 0.287 0.345 0.131 0.043 0.02 0.009  
 Year 2001 Pred = -1 0.247326 0.341186 0.260826 0.0985928 0.0348261 0.0147959  
 0.00244707  
 Year 2002 Obs = -1 0.122 0.474 0.246 0.1 0.037 0.014 0.007  
 Year 2002 Pred = -1 0.240036 0.402623 0.196528 0.103884 0.0373384 0.0131066  
 0.00648377  
 Year 2003 Obs = -1 0.229 0.403 0.238 0.075 0.029 0.011 0.015  
 Year 2003 Pred = -1 0.22773 0.384238 0.240356 0.0830553 0.0418388 0.0149462  
 0.00783506

Year 2004 Obs = -1 0.082 0.488 0.257 0.092 0.035 0.023 0.023  
Year 2004 Pred = -1 0.159106 0.398477 0.258511 0.116053 0.0382669 0.0191611  
0.0104242  
Year 2005 Obs = -1 0.22977 0.312687 0.237762 0.103896 0.0539461 0.025974  
0.035964  
Year 2005 Pred = -1 0.242318 0.278297 0.268979 0.125439 0.0537445 0.0176153  
0.0136072  
Year 2006 Obs = -1 0.125 0.43 0.204 0.117 0.063 0.027 0.034  
Year 2006 Pred = -1 0.122069 0.444393 0.19618 0.136059 0.0605469 0.0257855  
0.0149668  
Index number 2  
Year 1982 Obs = -1 0.308 0.63 0.053 0.009 0 0 0  
Year 1982 Pred = -1 0.364832 0.543278 0.0557618 0.0216204 0.00698379  
0.00620704 0.00131655  
Year 1983 Obs = -1 0.336327 0.41018 0.199601 0.0319361 0.010978 0 0.010978  
Year 1983 Pred = -1 0.344348 0.438862 0.189591 0.0165956 0.00634841  
0.00204836 0.00220647  
Year 1984 Obs = -1 0.258 0.5 0.136 0.076 0 0.015 0.015  
Year 1984 Pred = -1 0.533872 0.323845 0.100436 0.0366616 0.00316524  
0.00120945 0.000810519  
Year 1985 Obs = -1 0.231231 0.655656 0.0880881 0.017017 0.00800801 0 0  
Year 1985 Pred = -1 0.279052 0.604579 0.0850175 0.0222218 0.00799992  
0.000689907 0.000440237  
Year 1986 Obs = -1 0.692 0.201 0.093 0.009 0.005 0 0  
Year 1986 Pred = -1 0.57459 0.272812 0.13141 0.0155396 0.0040056 0.0014404  
0.000203464  
Year 1987 Obs = -1 0.505 0.462 0.022 0.011 0 0 0  
Year 1987 Pred = -1 0.539631 0.402679 0.0393118 0.0158581 0.00184913  
0.000476103 0.00019537  
Year 1988 Obs = -1 0.4 0.54 0.047 0.013 0 0 0  
Year 1988 Pred = -1 0.413543 0.488949 0.0870301 0.0071714 0.00285325  
0.000332326 0.000120666  
Year 1989 Obs = -1 0.187812 0.718282 0.0629371 0.030969 0 0 0  
Year 1989 Pred = -1 0.188365 0.639815 0.147324 0.0218977 0.00177909  
0.000707032 0.00011224  
Year 1990 Obs = -1 0.875 0.042 0.083 0 0 0 0  
Year 1990 Pred = -1 0.61683 0.201671 0.148156 0.028646 0.00419883  
0.000340749 0.0001569  
Year 1991 Obs = -1 0.731 0.25 0 0.019 0 0 0  
Year 1991 Pred = -1 0.601254 0.352186 0.0265105 0.0164079 0.00312882  
0.000458092 5.42881e-05  
Year 1992 Obs = -1 0.642 0.342 0.008 0 0.008 0 0  
Year 1992 Pred = -1 0.508347 0.434368 0.0516098 0.00325111 0.00198408  
0.000377913 6.18817e-05  
Year 1993 Obs = -1 0.575 0.394 0.031 0 0 0 0  
Year 1993 Pred = -1 0.543641 0.3821 0.0668844 0.00665393 0.000413312  
0.000251948 5.5842e-05  
Year 1994 Obs = -1 0.376 0.57 0.043 0.011 0 0 0  
Year 1994 Pred = -1 0.482746 0.436895 0.069078 0.0101745 0.000998238  
6.19358e-05 4.61187e-05  
Year 1995 Obs = -1 0.725 0.248 0.018 0 0 0 0.009  
Year 1995 Pred = -1 0.524749 0.378406 0.0838368 0.0112038 0.00162766  
0.000159512 1.72647e-05  
Year 1996 Obs = -1 0.614 0.318 0.068 0 0 0 0  
Year 1996 Pred = -1 0.399172 0.536605 0.056571 0.00667684 0.000840508  
0.00012157 1.31992e-05  
Year 1997 Obs = -1 0.274 0.632 0.085 0.009 0 0 0



Year 1997 Pred = -1 0.24114 0.605504 0.14347 0.00876115 0.000981856  
0.000123125 1.97366e-05  
Year 1998 Obs = -1 0.227227 0.437437 0.269269 0.0500501 0.00800801  
0.00800801 0  
Year 1998 Pred = -1 0.231613 0.441587 0.278927 0.044891 0.00264281  
0.000295357 4.29659e-05  
Year 1999 Obs = -1 0.137862 0.462537 0.2997 0.0809191 0.012987 0.00599401 0  
Year 1999 Pred = -1 0.23698 0.43272 0.218478 0.0959183 0.0149152 0.000875785  
0.000112092  
Year 2000 Obs = -1 0.0890891 0.481481 0.294294 0.0560561 0.0700701  
0.00900901 0  
Year 2000 Pred = -1 0.177228 0.455372 0.238015 0.0864878 0.0368087  
0.00571006 0.000378124  
Year 2001 Obs = -1 0.178 0.331 0.379 0.074 0.019 0.015 0.004  
Year 2001 Pred = -1 0.241712 0.361834 0.253841 0.0934891 0.0328652 0.0139519  
0.00230721  
Year 2002 Obs = -1 0.138 0.36 0.3 0.126 0.04 0.012 0.024  
Year 2002 Pred = -1 0.233407 0.42484 0.190303 0.0980109 0.0350588 0.0122969  
0.00608244  
Year 2003 Obs = -1 0.185814 0.442557 0.202797 0.0999001 0.044955 0.020979  
0.002997  
Year 2003 Pred = -1 0.221742 0.405993 0.233059 0.0784662 0.0393379 0.0140418  
0.00736008  
Year 2004 Obs = -1 0.0988024 0.478044 0.280439 0.0888224 0.0169661  
0.0199601 0.0169661  
Year 2004 Pred = -1 0.154917 0.421022 0.250654 0.109637 0.0359781 0.018001  
0.00979193  
Year 2005 Obs = -1 0.144 0.359 0.32 0.083 0.055 0.028 0.011  
Year 2005 Pred = -1 0.238526 0.297268 0.263665 0.119804 0.0510844 0.0167303  
0.012922  
Year 2006 Obs = -1 0.022977 0.587413 0.135864 0.140859 0.0509491 0.033966  
0.027972  
Year 2006 Pred = -1 0.118575 0.468434 0.18977 0.128235 0.0567919 0.0241675  
0.014026  
Index number 3  
Year 1982 Obs = 0.22 0.608 0.16 0.012 0 -1 -1 -1  
Year 1982 Pred = 0.202524 0.487367 0.276398 0.0243867 0.00932384 -1 -1 -1  
Year 1983 Obs = 0.332 0.505 0.118 0.042 0.003 -1 -1 -1  
Year 1983 Pred = 0.292272 0.420969 0.20433 0.0758797 0.00654963 -1 -1 -1  
Year 1984 Obs = 0.0869131 0.667333 0.206793 0.033966 0.004995 -1 -1 -1  
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Year 1985 Pred = 0.287867 0.365089 0.301244 0.0364146 0.00938562 -1 -1 -1  
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Year 1991 Obs = 0.447 0.494 0.053 0 0.006 -1 -1 -1  
Year 1991 Pred = 0.237756 0.611592 0.136435 0.00882828 0.005388 -1 -1 -1  
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Year 1992 Pred = 0.260259 0.543638 0.176912 0.018069 0.00112241 -1 -1 -1

Year 1993 Obs = 0.215 0.748 0.028 0.009 0 -1 -1 -1  
Year 1993 Pred = 0.242525 0.577384 0.154554 0.0232558 0.0022814 -1 -1 -1  
Year 1994 Obs = 0.48951 0.437562 0.0589411 0.00699301 0.00699301 -1 -1 -1  
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Year 1991 Pred = -1 -1 0.915024 0.0849761 -1 -1 -1 -1  
Year 1992 Obs = -1 -1 0.792 0.208 -1 -1 -1 -1  
Year 1992 Pred = -1 -1 0.872155 0.127845 -1 -1 -1 -1  
Year 1993 Obs = -1 -1 0.883 0.117 -1 -1 -1 -1  
Year 1993 Pred = -1 -1 0.822398 0.177602 -1 -1 -1 -1  
Year 1994 Obs = -1 -1 0.962 0.038 -1 -1 -1 -1  
Year 1994 Pred = -1 -1 0.836774 0.163226 -1 -1 -1 -1  
Year 1995 Obs = -1 -1 0.961 0.039 -1 -1 -1 -1  
Year 1995 Pred = -1 -1 0.785339 0.214661 -1 -1 -1 -1

Year 1996 Obs	=	-1	-1	0.857143	0.142857	-1	-1	-1	-1
Year 1996 Pred	=	-1	-1	0.884906	0.115094	-1	-1	-1	-1
Year 1997 Obs	=	-1	-1	0.876	0.124	-1	-1	-1	-1
Year 1997 Pred	=	-1	-1	0.773801	0.226199	-1	-1	-1	-1
Year 1998 Obs	=	-1	-1	0.648	0.352	-1	-1	-1	-1
Year 1998 Pred	=	-1	-1	0.562026	0.437974	-1	-1	-1	-1
Year 1999 Obs	=	-1	-1	0.441	0.559	-1	-1	-1	-1
Year 1999 Pred	=	-1	-1	0.616181	0.383819	-1	-1	-1	-1
Year 2000 Obs	=	-1	-1	0.579	0.421	-1	-1	-1	-1
Year 2000 Pred	=	-1	-1	0.60796	0.39204	-1	-1	-1	-1
Year 2001 Obs	=	-1	-1	0.584	0.416	-1	-1	-1	-1
Year 2001 Pred	=	-1	-1	0.536047	0.463953	-1	-1	-1	-1
Year 2002 Obs	=	-1	-1	0.792	0.208	-1	-1	-1	-1
Year 2002 Pred	=	-1	-1	0.644067	0.355933	-1	-1	-1	-1
Year 2003 Obs	=	-1	-1	0.698	0.302	-1	-1	-1	-1
Year 2003 Pred	=	-1	-1	0.585405	0.414595	-1	-1	-1	-1
Year 2004 Obs	=	-1	-1	0.467	0.533	-1	-1	-1	-1
Year 2004 Pred	=	-1	-1	0.576537	0.423463	-1	-1	-1	-1
Year 2005 Obs	=	-1	-1	0.254	0.746	-1	-1	-1	-1
Year 2005 Pred	=	-1	-1	0.477495	0.522505	-1	-1	-1	-1
Year 2006 Obs	=	-1	-1	0.714	0.286	-1	-1	-1	-1
Year 2006 Pred	=	-1	-1	0.666754	0.333246	-1	-1	-1	-1
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Year 1982 Pred	=	-1	-1	0.942916	0.0570843	-1	-1	-1	-1
Year 1983 Obs	=	-1	-1	0.802	0.198	-1	-1	-1	-1
Year 1983 Pred	=	-1	-1	0.796932	0.203068	-1	-1	-1	-1
Year 1984 Obs	=	-1	-1	0.678	0.322	-1	-1	-1	-1
Year 1984 Pred	=	-1	-1	0.845359	0.154641	-1	-1	-1	-1
Year 1985 Obs	=	-1	-1	0.979	0.021	-1	-1	-1	-1
Year 1985 Pred	=	-1	-1	0.923409	0.0765912	-1	-1	-1	-1
Year 1986 Obs	=	-1	-1	0.76	0.24	-1	-1	-1	-1
Year 1986 Pred	=	-1	-1	0.778747	0.221253	-1	-1	-1	-1
Year 1987 Obs	=	-1	-1	0.984	0.016	-1	-1	-1	-1
Year 1987 Pred	=	-1	-1	0.945552	0.0544476	-1	-1	-1	-1
Year 1988 Obs	=	-1	-1	0.986	0.014	-1	-1	-1	-1
Year 1988 Pred	=	-1	-1	0.904988	0.0950119	-1	-1	-1	-1
Year 1989 Obs	=	-1	-1	0.952	0.048	-1	-1	-1	-1
Year 1989 Pred	=	-1	-1	0.880425	0.119575	-1	-1	-1	-1
Year 1990 Obs	=	-1	-1	0	1	-1	-1	-1	-1
Year 1990 Pred	=	-1	-1	0.697682	0.302318	-1	-1	-1	-1
Year 1991 Obs	=	-1	-1	0.98	0.02	-1	-1	-1	-1
Year 1991 Pred	=	-1	-1	0.957488	0.0425117	-1	-1	-1	-1
Year 1992 Obs	=	-1	-1	1	0	-1	-1	-1	-1
Year 1992 Pred	=	-1	-1	0.934508	0.0654917	-1	-1	-1	-1
Year 1993 Obs	=	-1	-1	0.941	0.059	-1	-1	-1	-1
Year 1993 Pred	=	-1	-1	0.906415	0.0935846	-1	-1	-1	-1
Year 1994 Obs	=	-1	-1	1	0	-1	-1	-1	-1
Year 1994 Pred	=	-1	-1	0.914696	0.0853039	-1	-1	-1	-1
Year 1995 Obs	=	-1	-1	1	0	-1	-1	-1	-1
Year 1995 Pred	=	-1	-1	0.884424	0.115576	-1	-1	-1	-1
Year 1996 Obs	=	-1	-1	0.918	0.082	-1	-1	-1	-1
Year 1996 Pred	=	-1	-1	0.941458	0.0585422	-1	-1	-1	-1
Year 1997 Obs	=	-1	-1	0.811	0.189	-1	-1	-1	-1
Year 1997 Pred	=	-1	-1	0.87738	0.12262	-1	-1	-1	-1
Year 1998 Obs	=	-1	-1	0.692	0.308	-1	-1	-1	-1
Year 1998 Pred	=	-1	-1	0.728562	0.271438	-1	-1	-1	-1

Year 1999 Obs	=	-1	-1	0.713	0.287	-1	-1	-1	-1
Year 1999 Pred	=	-1	-1	0.770533	0.229467	-1	-1	-1	-1
Year 2000 Obs	=	-1	-1	0.823	0.177	-1	-1	-1	-1
Year 2000 Pred	=	-1	-1	0.764353	0.235647	-1	-1	-1	-1
Year 2001 Obs	=	-1	-1	0.779	0.221	-1	-1	-1	-1
Year 2001 Pred	=	-1	-1	0.707318	0.292682	-1	-1	-1	-1
Year 2002 Obs	=	-1	-1	0.88	0.12	-1	-1	-1	-1
Year 2002 Pred	=	-1	-1	0.791008	0.208992	-1	-1	-1	-1
Year 2003 Obs	=	-1	-1	0.83	0.17	-1	-1	-1	-1
Year 2003 Pred	=	-1	-1	0.747053	0.252947	-1	-1	-1	-1
Year 2004 Obs	=	-1	-1	0.915	0.085	-1	-1	-1	-1
Year 2004 Pred	=	-1	-1	0.740108	0.259892	-1	-1	-1	-1
Year 2005 Obs	=	-1	-1	0.603	0.397	-1	-1	-1	-1
Year 2005 Pred	=	-1	-1	0.656531	0.343469	-1	-1	-1	-1
Year 2006 Obs	=	-1	-1	0.87	0.13	-1	-1	-1	-1
Year 2006 Pred	=	-1	-1	0.807134	0.192866	-1	-1	-1	-1
Index number 6									
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Year 1984 Pred	=	-1	-1	0.671702	0.223603	0.104696	-1	-1	-1
Year 1985 Obs	=	-1	-1	0.768	0.095	0.137	-1	-1	-1
Year 1985 Pred	=	-1	-1	0.832262	0.125621	0.0421177	-1	-1	-1
Year 1986 Obs	=	-1	-1	0.526	0.432	0.042	-1	-1	-1
Year 1986 Pred	=	-1	-1	0.626783	0.324061	0.0491556	-1	-1	-1
Year 1987 Obs	=	-1	-1	0.827	0.135	0.038	-1	-1	-1
Year 1987 Pred	=	-1	-1	0.862806	0.0904114	0.0467827	-1	-1	-1
Year 1988 Obs	=	-1	-1	0.835	0.131	0.034	-1	-1	-1
Year 1988 Pred	=	-1	-1	0.825596	0.157732	0.016672	-1	-1	-1
Year 1989 Obs	=	-1	-1	0.55045	0.26973	0.17982	-1	-1	-1
Year 1989 Pred	=	-1	-1	0.772633	0.190958	0.036408	-1	-1	-1
Year 1990 Obs	=	-1	-1	0.537	0.317	0.146	-1	-1	-1
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Year 1991 Obs	=	-1	-1	0.768	0.118	0.114	-1	-1	-1
Year 1991 Pred	=	-1	-1	0.873407	0.0705682	0.0560243	-1	-1	-1
Year 1992 Obs	=	-1	-1	0.882118	0.0989011	0.018981	-1	-1	-1
Year 1992 Pred	=	-1	-1	0.87886	0.112083	0.00905674	-1	-1	-1
Year 1993 Obs	=	-1	-1	0.82018	0.0819181	0.0979021	-1	-1	-1
Year 1993 Pred	=	-1	-1	0.825177	0.155039	0.0197846	-1	-1	-1
Year 1994 Obs	=	-1	-1	0.88	0.07	0.05	-1	-1	-1
Year 1994 Pred	=	-1	-1	0.832103	0.141217	0.0266805	-1	-1	-1
Year 1995 Obs	=	-1	-1	0.671	0.263	0.066	-1	-1	-1
Year 1995 Pred	=	-1	-1	0.782124	0.185993	0.031883	-1	-1	-1
Year 1996 Obs	=	-1	-1	0.70971	0.229229	0.0610611	-1	-1	-1
Year 1996 Pred	=	-1	-1	0.884729	0.100114	0.0151567	-1	-1	-1
Year 1997 Obs	=	-1	-1	0.845	0.095	0.06	-1	-1	-1
Year 1997 Pred	=	-1	-1	0.784778	0.199588	0.015634	-1	-1	-1
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Year 1999 Obs	=	-1	-1	0.531	0.345	0.124	-1	-1	-1
Year 1999 Pred	=	-1	-1	0.541382	0.293393	0.165225	-1	-1	-1
Year 2000 Obs	=	-1	-1	0.548	0.396	0.056	-1	-1	-1
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0.00883545 0.00437027  
Year 2003 Obs = 0 0.430569 0.388611 0.11988 0.025974 0.026973 0.004995  
0.002997  
Year 2003 Pred = 0.0279908 0.345997 0.348703 0.174525 0.0579672 0.0290265  
0.0103601 0.00543023  
Year 2004 Obs = 0.131 0.197 0.386 0.225 0.041 0.012 0.008 0  
Year 2004 Pred = 0.0443786 0.251335 0.375986 0.195162 0.0842145 0.0276028  
0.0138091 0.00751163  
Year 2005 Obs = 0.028 0.454 0.309 0.147 0.036 0.013 0.005 0.008  
Year 2005 Pred = 0.0208425 0.37453 0.256929 0.198688 0.0890633 0.0379315  
0.0124214 0.00959386  
Year 2006 Obs = 0.074 0.165 0.45 0.175 0.073 0.033 0.016 0.014  
Year 2006 Pred = 0.023707 0.201988 0.43923 0.155141 0.103422 0.0457485  
0.0194661 0.0112973  
Index number 8  
Year 1982 Obs = -1 -1 0.881 0.119 -1 -1 -1 -1  
Year 1982 Pred = -1 -1 0.947854 0.0521459 -1 -1 -1 -1  
Year 1983 Obs = -1 -1 0.792 0.208 -1 -1 -1 -1  
Year 1983 Pred = -1 -1 0.811981 0.188019 -1 -1 -1 -1  
Year 1984 Obs = -1 -1 0.831 0.169 -1 -1 -1 -1  
Year 1984 Pred = -1 -1 0.857461 0.142539 -1 -1 -1 -1  
Year 1985 Obs = -1 -1 0.933 0.067 -1 -1 -1 -1  
Year 1985 Pred = -1 -1 0.929909 0.0700907 -1 -1 -1 -1  
Year 1986 Obs = -1 -1 0.797 0.203 -1 -1 -1 -1  
Year 1986 Pred = -1 -1 0.794797 0.205203 -1 -1 -1 -1  
Year 1987 Obs = -1 -1 0.949 0.051 -1 -1 -1 -1  
Year 1987 Pred = -1 -1 0.950275 0.0497253 -1 -1 -1 -1  
Year 1988 Obs = -1 -1 1 0 -1 -1 -1 -1  
Year 1988 Pred = -1 -1 0.912905 0.0870954 -1 -1 -1 -1  
Year 1989 Obs = -1 -1 1 0 -1 -1 -1 -1  
Year 1989 Pred = -1 -1 0.890139 0.109861 -1 -1 -1 -1  
Year 1990 Obs = -1 -1 1 0 -1 -1 -1 -1  
Year 1990 Pred = -1 -1 0.717479 0.282521 -1 -1 -1 -1  
Year 1991 Obs = -1 -1 0.889 0.111 -1 -1 -1 -1  
Year 1991 Pred = -1 -1 0.961218 0.0387822 -1 -1 -1 -1  
Year 1992 Obs = -1 -1 0.788 0.212 -1 -1 -1 -1  
Year 1992 Pred = -1 -1 0.940128 0.0598721 -1 -1 -1 -1  
Year 1993 Obs = -1 -1 0.759 0.241 -1 -1 -1 -1  
Year 1993 Pred = -1 -1 0.914224 0.0857758 -1 -1 -1 -1  
Year 1994 Obs = -1 -1 1 0 -1 -1 -1 -1  
Year 1994 Pred = -1 -1 0.921873 0.0781265 -1 -1 -1 -1  
Year 1995 Obs = -1 -1 1 0 -1 -1 -1 -1

Year 1995 Pred = -1 -1 0.893853 0.106147 -1 -1 -1 -1  
Year 1996 Obs = -1 -1 0.99 0.01 -1 -1 -1 -1  
Year 1996 Pred = -1 -1 0.946515 0.0534848 -1 -1 -1 -1  
Year 1997 Obs = -1 -1 0.97 0.03 -1 -1 -1 -1  
Year 1997 Pred = -1 -1 0.887311 0.112689 -1 -1 -1 -1  
Year 1998 Obs = -1 -1 0.8 0.2 -1 -1 -1 -1  
Year 1998 Pred = -1 -1 0.74707 0.25293 -1 -1 -1 -1  
Year 1999 Obs = -1 -1 0.845 0.155 -1 -1 -1 -1  
Year 1999 Pred = -1 -1 0.787016 0.212984 -1 -1 -1 -1  
Year 2000 Obs = -1 -1 0.734 0.266 -1 -1 -1 -1  
Year 2000 Pred = -1 -1 0.781154 0.218846 -1 -1 -1 -1  
Year 2001 Obs = -1 -1 0.677 0.323 -1 -1 -1 -1  
Year 2001 Pred = -1 -1 0.726731 0.273269 -1 -1 -1 -1  
Year 2002 Obs = -1 -1 0.775 0.225 -1 -1 -1 -1  
Year 2002 Pred = -1 -1 0.80639 0.19361 -1 -1 -1 -1  
Year 2003 Obs = -1 -1 0.809 0.191 -1 -1 -1 -1  
Year 2003 Pred = -1 -1 0.764708 0.235292 -1 -1 -1 -1  
Year 2004 Obs = -1 -1 0.625 0.375 -1 -1 -1 -1  
Year 2004 Pred = -1 -1 0.75809 0.24191 -1 -1 -1 -1  
Year 2005 Obs = -1 -1 0.667 0.333 -1 -1 -1 -1  
Year 2005 Pred = -1 -1 0.677778 0.322222 -1 -1 -1 -1  
Year 2006 Obs = -1 -1 0.72 0.28 -1 -1 -1 -1  
Year 2006 Pred = -1 -1 0.821597 0.178403 -1 -1 -1 -1  
Index number 9  
Year 1990 Obs = 0.07 0.59 0.14 0.17 0.03 0 0 0  
Year 1990 Pred = 0.143929 0.554761 0.160515 0.114975 0.0221835 0.0032511  
0.000263834 0.000121484  
Year 1991 Obs = 0 0.47 0.53 0 0 0 0  
Year 1991 Pred = 0.0868601 0.576064 0.29862 0.0219166 0.0135361 0.0025808  
0.000377853 4.4779e-05  
Year 1992 Obs = 0.03 0.44 0.38 0.12 0.03 0 0 0  
Year 1992 Pred = 0.0910626 0.490415 0.370847 0.0429614 0.0027006 0.00164788  
0.000313872 5.13953e-05  
Year 1993 Obs = 0.04 0.42 0.35 0.15 0 0 0.04 0  
Year 1993 Pred = 0.0856223 0.52555 0.326898 0.0557916 0.00553867 0.000343986  
0.000209687 4.6475e-05  
Year 1994 Obs = 0.237624 0.465347 0.237624 0 0.0594059 0 0 0  
Year 1994 Pred = 0.105068 0.460234 0.368612 0.0568254 0.00835218 0.000819323  
5.08345e-05 3.78524e-05  
Year 1995 Obs = 0.376238 0.247525 0.247525 0.128713 0 0 0 0  
Year 1995 Pred = 0.100653 0.500366 0.319322 0.0689786 0.00919869 0.00133617  
0.000130945 1.41727e-05  
Year 1996 Obs = 0.019802 0.425743 0.415842 0.138614 0 0 0 0  
Year 1996 Pred = 0.0461533 0.409646 0.487345 0.050094 0.00589991 0.000742596  
0.000107407 1.16615e-05  
Year 1997 Obs = 0.0505051 0.232323 0.525253 0.181818 0.010101 0 0 0  
Year 1997 Pred = 0.0411157 0.254288 0.565076 0.130545 0.00795505 0.000891386  
0.000111779 1.79178e-05  
Year 1998 Obs = 0 0.16 0.56 0.26 0.02 0 0 0  
Year 1998 Pred = 0.0419437 0.24538 0.414024 0.254982 0.0409507 0.00241048  
0.00026939 3.91884e-05  
Year 1999 Obs = 0.03 0.29 0.41 0.19 0.06 0.02 0 0  
Year 1999 Pred = 0.0314039 0.25371 0.409983 0.201825 0.0884204 0.0137472  
0.000807198 0.000103314  
Year 2000 Obs = 0.03 0.24 0.47 0.19 0.05 0.02 0 0  
Year 2000 Pred = 0.039847 0.189706 0.431369 0.219835 0.079713 0.0339204  
0.00526195 0.00034845

Year 2001 Obs = 0.01 0.43 0.29 0.15 0.06 0.04 0.02 0  
Year 2001 Pred = 0.0451052 0.255391 0.338338 0.231427 0.085054 0.0298956  
0.0126911 0.00209871  
Year 2002 Obs = 0.0505051 0.40404 0.313131 0.151515 0.0505051 0.020202 0  
0.010101  
Year 2002 Pred = 0.0438966 0.246864 0.397651 0.173673 0.0892572 0.0319229  
0.0111968 0.00553833  
Year 2003 Obs = 0.010101 0.393939 0.383838 0.121212 0.0606061 0.020202  
0.010101 0  
Year 2003 Pred = 0.0288129 0.238753 0.386859 0.216526 0.072746 0.0364648  
0.0130161 0.00682246  
Year 2004 Obs = 0.049505 0.247525 0.405941 0.207921 0.0594059 0.019802  
0.00990099 0  
Year 2004 Pred = 0.0436932 0.165881 0.398967 0.231588 0.101084 0.0331665  
0.0165941 0.00902661  
Year 2005 Obs = 0.02 0.22 0.39 0.21 0.07 0.06 0.01 0.02  
Year 2005 Pred = 0.0214864 0.258824 0.285464 0.246868 0.111935 0.0477221  
0.015629 0.0120714  
Year 2006 Obs = 0 0.178218 0.356436 0.217822 0.168317 0.049505 0.019802  
0.00990099  
Year 2006 Pred = 0.0228183 0.130327 0.455641 0.179975 0.12136 0.053739  
0.0228681 0.0132718  
Index number 10  
Year 1988 Obs = 0.04 0.72 0.24 0 0 0 0 0  
Year 1988 Pred = 0.10567 0.551345 0.289759 0.0474307 0.00395567 0.00158734  
0.000185532 6.74548e-05  
Year 1989 Obs = 0.59 0.3 0.11 0 0 0 0 0  
Year 1989 Pred = 0.441879 0.193564 0.292246 0.061885 0.00930973 0.000762868  
0.000304239 4.83613e-05  
Year 1990 Obs = 0.45 0.5 0.04 0.01 0 0 0 0  
Year 1990 Pred = 0.521992 0.377602 0.0548761 0.0370746 0.00725516 0.00107257  
8.73483e-05 4.02734e-05  
Year 1991 Obs = 0.25 0.68 0.07 0 0 0 0 0  
Year 1991 Pred = 0.383375 0.477187 0.124244 0.00860076 0.00538763 0.00103619  
0.000152242 1.8066e-05  
Year 1992 Obs = 0.232323 0.636364 0.121212 0.010101 0 0 0 0  
Year 1992 Pred = 0.409624 0.414023 0.157251 0.0171824 0.00109549 0.000674296  
0.000128886 2.11326e-05  
Year 1993 Obs = 0.30303 0.676768 0.020202 0 0 0 0 0  
Year 1993 Pred = 0.388157 0.447146 0.139696 0.0224879 0.00226428 0.000141854  
8.67762e-05 1.92586e-05  
Year 1994 Obs = 0.584158 0.376238 0.029703 0 0.00990099 0 0 0  
Year 1994 Pred = 0.452725 0.372182 0.149722 0.0217703 0.00324537 0.000321142  
1.99954e-05 1.49087e-05  
Year 1995 Obs = 0.59 0.35 0.03 0.01 0.02 0 0 0  
Year 1995 Pred = 0.434301 0.405195 0.12988 0.0264628 0.00357924 0.00052445  
5.15772e-05 5.58983e-06  
Year 1996 Obs = 0.168317 0.524752 0.277228 0.019802 0.00990099 0 0 0  
Year 1996 Pred = 0.265189 0.441749 0.263962 0.0255916 0.00305704 0.000388137  
5.6337e-05 6.12476e-06  
Year 1997 Obs = 0.10101 0.505051 0.323232 0.0606061 0.010101 0 0 0  
Year 1997 Pred = 0.266079 0.308847 0.344716 0.075114 0.00464246 0.000524746  
6.60348e-05 1.05992e-05  
Year 1998 Obs = 0.0707071 0.616162 0.282828 0.030303 0 0 0 0  
Year 1998 Pred = 0.273007 0.299752 0.254031 0.147563 0.0240365 0.00142722  
0.000160065 2.33157e-05  
Year 1999 Obs = 0.09 0.53 0.3 0.06 0.01 0.01 0 0



Year 1999 Pred = 0.2167 0.328569 0.266682 0.123826 0.0550212 0.00862921  
 0.000508468 6.51653e-05  
 Year 2000 Obs = 0.128713 0.524752 0.247525 0.0594059 0.019802 0.00990099  
 0.00990099 0  
 Year 2000 Pred = 0.272094 0.243119 0.277666 0.133468 0.0490856 0.0210699  
 0.00328003 0.000217493  
 Year 2001 Obs = 0.11 0.58 0.21 0.07 0.02 0.01 0 0  
 Year 2001 Pred = 0.286844 0.304817 0.202825 0.130855 0.0487771 0.0172944  
 0.0073676 0.00121998  
 Year 2002 Obs = 0.09 0.54 0.25 0.08 0.03 0.01 0 0  
 Year 2002 Pred = 0.282048 0.29769 0.24085 0.0992163 0.0517175 0.0186584  
 0.00656743 0.00325277  
 Year 2003 Obs = 0.0594059 0.564356 0.257426 0.0594059 0.019802 0.019802  
 0.00990099 0.00990099  
 Year 2003 Pred = 0.204304 0.317726 0.258579 0.136508 0.0465158 0.0235203  
 0.00842519 0.00442194  
 Year 2004 Obs = 0.0808081 0.59596 0.232323 0.0505051 0.020202 0.010101  
 0.010101 0  
 Year 2004 Pred = 0.29623 0.21107 0.254979 0.139602 0.0618014 0.0204548  
 0.0102701 0.005594  
 Year 2005 Obs = 0.277228 0.534653 0.108911 0.049505 0.019802 0.00990099 0 0  
 Year 2005 Pred = 0.15812 0.357473 0.198029 0.161528 0.0742837 0.0319465  
 0.0104994 0.00812017  
 Year 2006 Obs = 0.0792079 0.534653 0.29703 0.049505 0.019802 0.00990099  
 0.00990099 0  
 Year 2006 Pred = 0.182016 0.195109 0.342611 0.127644 0.0872978 0.0389939  
 0.016652 0.00967701  
 Index number 11  
 N/A  
 Index number 12  
 N/A  
 Index number 13  
 N/A

Index Selectivity at Age

0.0612985 0.308279 0.752582 0.95406 0.993013 0.998989 0.999871 1  
 0.0384494 0.319544 0.846508 0.984796 0.998688 0.999889 0.999991 1  
 0.340174 0.99113 0.999959 1 1 1 1 1  
 0 0 0.696733 0.999999 0 0 0 0  
 0 0 0.999999 0.68619 0 0 0 0  
 0 0 0.615634 0.768747 1 0 0 0  
 0.0603079 0.675801 0.985445 0.999545 0.999986 1 1 1  
 0 0 1 0.623561 0 0 0 0  
 0.0494111 0.37117 0.870175 0.987033 0.998845 0.999899 0.999992 1  
 0.540556 0.762086 0.897378 0.960081 0.98541 0.995068 0.998669 1  
 1 0 0 0 0 0 0 0  
 1 0 0 0 0 0 0 0  
 1 0 0 0 0 0 0 0

Deviations section: only applicable if associated lambda > 0

Nyear1 observed, expected, standardized residual

2 41325.1 26197.7 0.591731  
 3 23229.6 12015.3 0.855858  
 4 2049.47 3640.42 -0.745861  
 5 783.58 1079.1 -0.415446  
 6 252.807 319.652 -0.304574  
 7 224.667 94.6859 1.12174

8 47.6525 39.8523 0.232067

Fleet Obs, Initial, and Standardized Residual for Fmult

1 1.01667 1 0.0214614

Standardized Residuals for Fmult\_devs by fleet and year

N/A

Index Obs, Initial, and Standardized Residual for q\_year1

N/A

Standardized Residuals for catchability deviations by index and year

index 1 q\_devs standardized residuals

2 0

3 0

4 0

5 0

6 0

7 0

8 0

9 0

10 0

11 0

12 0

13 0

14 0

15 0

index 2 q\_devs standardized residuals

2 0

3 0

4 0

5 0

6 0

7 0

8 0

9 0

10 0

11 0

12 0

13 0

14 0

15 0

16 0

17 0

18 0

19 0

20 0

21 0

22 0

23 0

24 0

25 0

index 3 q\_devs standardized residuals

2 0

3 0

4 0

5 0

6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
23 0  
24 0  
25 0

index 4 q\_devs standardized residuals

2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
23 0  
24 0  
25 0

index 5 q\_devs standardized residuals

2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0

13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
23 0  
24 0  
25 0

index 6 q\_devs standardized residuals

2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
23 0

index 7 q\_devs standardized residuals

2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0

```
22 0
23 0
  index 8 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
20 0
21 0
22 0
23 0
24 0
25 0
  index 9 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
  index 10 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
```

14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
index 11 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
index 12 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
23 0  
24 0  
25 0  
index 13 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0



Fmult by year for each fleet

1982 1.01667  
1983 1.44772  
1984 1.56668  
1985 1.66922  
1986 1.86084  
1987 1.49672  
1988 1.994  
1989 1.73682  
1990 1.58354  
1991 1.89415  
1992 1.86993  
1993 1.6404  
1994 1.43306  
1995 1.93142  
1996 1.60304  
1997 0.978431  
1998 0.888182  
1999 0.751541  
2000 0.834523  
2001 0.673641  
2002 0.581336  
2003 0.527712  
2004 0.521252  
2005 0.52825  
2006 0.428633

Directed F by age and year for each fleet

fleet 1 directed F at age  
0.0390337 0.579494 0.99408 1.01597 1.01665 1.01667 1.01667 1.01667  
0.0555832 0.825188 1.41555 1.44673 1.44769 1.44772 1.44772 1.44772  
0.0601505 0.892994 1.53187 1.5656 1.56664 1.56668 1.56668 1.56668  
0.0640874 0.951441 1.63213 1.66807 1.66918 1.66922 1.66922 1.66922  
0.0714446 1.06067 1.8195 1.85957 1.8608 1.86084 1.86084 1.86084  
0.0574648 0.853122 1.46347 1.4957 1.49669 1.49672 1.49672 1.49672  
0.076557 1.13656 1.94969 1.99263 1.99396 1.994 1.994 1.994  
0.066683 0.989975 1.69823 1.73563 1.73679 1.73682 1.73682 1.73682  
0.0607982 0.902609 1.54836 1.58246 1.58351 1.58354 1.58354 1.58354  
0.0727236 1.07965 1.85207 1.89286 1.89411 1.89415 1.89415 1.89415  
0.0717935 1.06584 1.82838 1.86865 1.86989 1.86993 1.86993 1.86993  
0.0629812 0.935019 1.60396 1.63928 1.64037 1.6404 1.6404 1.6404  
0.0550206 0.816835 1.40122 1.43208 1.43303 1.43306 1.43306 1.43306  
0.0230218 0.288547 1.38845 1.8809 1.92786 1.93118 1.9314 1.93142  
0.0191077 0.239489 1.15239 1.56111 1.60009 1.60284 1.60303 1.60304  
0.0116625 0.146174 0.703371 0.952839 0.97663 0.978308 0.978423 0.978431  
0.0105868 0.132691 0.638492 0.86495 0.886547 0.88807 0.888174 0.888182  
0.00895809 0.112278 0.540265 0.731883 0.750157 0.751446 0.751535 0.751541  
0.00994721 0.124675 0.599919 0.812695 0.832987 0.834418 0.834517 0.834523  
0.00802956 0.10064 0.484265 0.656021 0.672401 0.673556 0.673636 0.673641  
0.00692931 0.0868496 0.417909 0.56613 0.580266 0.581263 0.581331 0.581336  
0.00629014 0.0788384 0.37936 0.513909 0.526741 0.527646 0.527708 0.527712  
0.00621313 0.0778732 0.374716 0.507618 0.520292 0.521186 0.521248 0.521252  
0.00629654 0.0789186 0.379746 0.514432 0.527277 0.528183 0.528245 0.52825  
0.00510914 0.0640362 0.308134 0.417421 0.427844 0.428579 0.428629 0.428633

Discard F by age and year for each fleet

fleet 1 Discard F at age  
0 0 0 0 0 0 0 0





1985	1.65646	1.6369	1.64029
1986	1.84662	1.83221	1.83712
1987	1.48529	1.46688	1.46951
1988	1.97876	1.9558	1.9592
1989	1.72355	1.70518	1.7078
1990	1.57144	1.56307	1.56709
1991	1.87968	1.85596	1.85952
1992	1.85564	1.83233	1.83471
1993	1.62787	1.60898	1.61237
1994	1.42211	1.40539	1.40842
1995	1.73241	1.47674	1.51053
1996	1.43786	1.19031	1.21094
1997	0.877613	0.747913	0.757708
1998	0.796663	0.727086	0.74853
1999	0.674102	0.615854	0.63962
2000	0.748534	0.682587	0.710033
2001	0.604229	0.563724	0.580894
2002	0.521435	0.474103	0.489852
2003	0.473337	0.43399	0.449618
2004	0.467542	0.43252	0.448102
2005	0.473818	0.452504	0.466889
2006	0.384466	0.349794	0.364892

Population Numbers at the Start of the Year

50033.9	41325.1	23229.6	2049.47	783.58	252.807	224.667	47.6525
79692.8	39396.1	18953.3	7038.16	607.506	232.113	74.8854	80.6651
32813.6	61719.3	14132.5	3767.55	1356.11	116.942	44.6793	29.9418
58115.9	25297.2	20689	2500.81	644.565	231.767	19.9854	12.7527
45915.4	44627.6	7998.48	3311.74	386.176	99.4241	35.7488	5.04967
45409.9	44909.9	12650.4	1061.58	422.277	49.1802	12.6614	5.19556
9484.77	35102.2	15666.7	2397	194.768	77.3985	9.0139	3.27287
23150.6	7193.16	9223	1825.48	267.558	21.7118	8.62764	1.36961
34556.9	17731.4	2188.37	1381.91	263.477	38.573	3.13	1.44122
30155.8	26623.9	5886.88	380.905	232.47	44.2764	6.48187	0.768155
32022.3	22957.7	7405	756.281	46.9785	28.6355	5.45373	0.893017
29863.2	24401.4	6474.08	974.117	95.5611	5.92869	3.61366	0.800927
39370.1	22957.5	7843	1065.93	154.818	15.1711	0.941199	0.700831
46100.1	30507.9	8304.6	1581.54	208.413	30.2415	2.96339	0.320738
31216.8	36884.6	18717.1	1696.15	197.404	24.8202	3.58959	0.389728
30455.2	25074.4	23767.2	4840.66	291.489	32.6278	4.09113	0.655788
31645.6	24645.5	17737.4	9630.49	1528.39	89.8708	10.0428	1.46093
23837	25636.4	17670.6	7668.97	3320.07	515.647	30.2744	3.87481
30518.7	19342	18760.1	8428.66	3020.13	1283.8	199.134	13.1866
32821.4	24739.3	13979.7	8430.16	3061.62	1074.99	456.306	75.4582
35606.7	26657	18315.6	7052.21	3581.54	1279.59	448.77	221.975
26245.3	28951	20009.4	9873.4	3277.93	1641.36	585.833	307.064
42249.9	21353.1	21906.2	11210.4	4835.26	1584.82	792.853	431.282
21437.6	34377.1	16172.7	12330.2	5524.67	2352.88	770.5	595.106
22939.2	17441.5	26009.7	9057.35	6035.26	2669.65	1135.94	659.252

q by index

index 1 q over time	
1992	0.000560461
1993	0.000560461
1994	0.000560461
1995	0.000560461
1996	0.000560461

1997 0.000560461  
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2006 0.000560461

index 2 q over time

1982 5.29284e-05  
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index 3 q over time

1982 3.37882e-05  
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index 4 q over time  
1982 6.83234e-05  
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index 5 q over time  
1982 4.68664e-05  
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index 6 q over time

1984 3.23216e-05  
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index 7 q over time

1984 3.62562e-05  
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index 8 q over time

1982 3.37891e-05  
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index 9 q over time

1990 2.31569e-05  
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index 10 q over time

1988 0.000128544  
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2006 0.000128544

index 11 q over time

1986 5.45856e-06

1987 5.45856e-06  
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2006 5.45856e-06

index 12 q over time

1982 0.000242921  
1983 0.000242921  
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index 13 q over time

1982 2.86838e-05  
1983 2.86838e-05  
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 2004 2.86838e-05  
 2005 2.86838e-05  
 2006 2.86838e-05

Proportions of catch at age by fleet  
 fleet 1

Year 1 Obs = 0.146845 0.533716 0.27888 0.0256925 0.00901297 0.00318751  
 0.00184106 0.000824357  
 Year 1 Pred = 0.0513598 0.491732 0.398533 0.0356207 0.0136243 0.00439569  
 0.0039064 0.00082856  
 Year 2 Obs = 0.103612 0.598342 0.229546 0.0458839 0.0145793 0.00679528  
 0.000336608 0.000904635  
 Year 2 Pred = 0.0903823 0.4702 0.307665 0.115427 0.00996629 0.00380791  
 0.00122853 0.00132334  
 Year 3 Obs = 0.0942382 0.521666 0.303281 0.0624068 0.0162689 0.00186435  
 7.84991e-05 0.000196248  
 Year 3 Pred = 0.0351405 0.677824 0.208033 0.0559939 0.0201605 0.00173852  
 0.000664228 0.000445131  
 Year 4 Obs = 0.0558107 0.392743 0.482878 0.0474579 0.0133215 0.00676819  
 0.000805737 0.000214863  
 Year 4 Pred = 0.0918882 0.401264 0.434567 0.0530069 0.0136659 0.0049139  
 0.000423727 0.000270382  
 Year 5 Obs = 0.0563748 0.497562 0.320918 0.109789 0.00917325 0.0040641  
 0.0016837 0.000435439  
 Year 5 Pred = 0.0924713 0.674898 0.156781 0.0654444 0.00763323 0.00196525  
 0.000706623 9.98135e-05  
 Year 6 Obs = 0.0361216 0.546812 0.344315 0.0523557 0.0172825 0.000794231  
 0.000921308 0.00139785  
 Year 6 Pred = 0.0636797 0.655715 0.249685 0.021163 0.00842079 0.000980731  
 0.000252487 0.000103608  
 Year 7 Obs = 0.0204602 0.529056 0.374768 0.0549979 0.016574 0.00311406  
 0.000488985 0.000540457  
 Year 7 Pred = 0.0169801 0.589054 0.336018 0.0517995 0.00420993 0.00167299  
 0.000194837 7.07438e-05  
 Year 8 Obs = 0.063287 0.315776 0.48164 0.111543 0.0232711 0.00362582  
 0.000593315 0.000263696  
 Year 8 Pred = 0.0956689 0.293961 0.495269 0.0988857 0.0144974 0.00117644  
 0.000467484 7.42115e-05  
 Year 9 Obs = 0.131557 0.624327 0.155018 0.0705274 0.0156649 0.00212645  
 0.000567054 0.000212645  
 Year 9 Pred = 0.12849 0.67366 0.111213 0.0709001 0.0135217 0.0019796  
 0.000160635 7.39647e-05  
 Year 10 Obs = 0.0470108 0.570563 0.335697 0.0348471 0.0101911 0.00150284  
 0.000140891 4.69638e-05



Year 10 Pred = 0.0824055 0.696157 0.198802 0.0129663 0.00791536 0.00150757  
0.000220702 2.6155e-05  
Year 11 Obs = 0.0686058 0.561535 0.302207 0.0564193 0.00757272 0.00351053  
0.000100301 5.01505e-05  
Year 11 Pred = 0.0900669 0.620978 0.259357 0.0267036 0.00165917 0.00101135  
0.000192614 3.15395e-05  
Year 12 Obs = 0.0682494 0.596718 0.297482 0.0300616 0.0038772 0.00239006  
0.00106225 0.000159337  
Year 12 Pred = 0.079083 0.652267 0.229935 0.0349171 0.00342633 0.000212574  
0.000129568 2.87174e-05  
Year 13 Obs = 0.0809769 0.51226 0.345857 0.0485466 0.0101345 0.00128535  
0.00069211 0.000247182  
Year 13 Pred = 0.0954296 0.587489 0.273478 0.0375545 0.00545618 0.000534675  
3.31706e-05 2.46993e-05  
Year 14 Obs = 0.0383395 0.377437 0.472962 0.0802409 0.0257108 0.00498672  
0.000259051 6.47626e-05  
Year 14 Pred = 0.0628503 0.460095 0.381638 0.0826585 0.0109896 0.0015956  
0.000156361 1.69236e-05  
Year 15 Obs = 0.00868307 0.371174 0.497293 0.0956745 0.0223509 0.00380554  
0.000857587 0.000160798  
Year 15 Pred = 0.0256037 0.341667 0.56519 0.0595162 0.00700105 0.000880909  
0.000127407 1.38328e-05  
Year 16 Obs = 0.00206925 0.175541 0.554973 0.217202 0.0381432 0.011036  
0.000758725 0.0002759  
Year 16 Pred = 0.0184486 0.178549 0.634345 0.157775 0.00964452 0.00108068  
0.000135514 2.17223e-05  
Year 17 Obs = 0.00299222 0.148481 0.42423 0.348627 0.0651639 0.00917614  
0.00126338 6.64938e-05  
Year 17 Pred = 0.0180279 0.166009 0.457522 0.305855 0.0493113 0.00290272  
0.000324395 4.71899e-05  
Year 18 Obs = 0.0127178 0.153527 0.439854 0.282322 0.0815767 0.0251546  
0.00386453 0.000983699  
Year 18 Pred = 0.0129023 0.165534 0.451615 0.244462 0.107641 0.0167375  
0.000982765 0.000125784  
Year 19 Obs = 0.00135811 0.0949441 0.49182 0.288289 0.0943885 0.0228409  
0.00456818 0.00179023  
Year 19 Pred = 0.0163637 0.123053 0.462971 0.25739 0.0937349 0.0398898  
0.00618787 0.000409764  
Year 20 Obs = 0.000832829 0.218655 0.360388 0.282935 0.0978952 0.0274833  
0.00931254 0.00249849  
Year 20 Pred = 0.0181602 0.164124 0.374195 0.283605 0.104831 0.0368531  
0.0156445 0.00258711  
Year 21 Obs = 0.0218685 0.0912526 0.435038 0.308651 0.104679 0.0256472  
0.0108538 0.00200997  
Year 21 Pred = 0.0171921 0.155254 0.440431 0.215136 0.111299 0.0398153  
0.013965 0.00690753  
Year 22 Obs = 0.019559 0.119544 0.372829 0.30222 0.119242 0.0425162  
0.0175955 0.00649449  
Year 22 Pred = 0.0108833 0.145323 0.420349 0.264599 0.0895318 0.0448906  
0.0160237 0.00839888  
Year 23 Obs = 0.00730276 0.0718673 0.386841 0.319956 0.130153 0.0524843  
0.020748 0.010647  
Year 23 Pred = 0.0159763 0.0977808 0.420512 0.274708 0.120769 0.0396359  
0.0198308 0.0107873  
Year 24 Obs = 0.0172803 0.13655 0.262167 0.285301 0.155593 0.0739879  
0.0359712 0.03315

Year 24 Pred = 0.00805196 0.156292 0.30768 0.299232 0.136646 0.0582727  
 0.0190843 0.0147401  
 Year 25 Obs = 0.0148916 0.0835802 0.395291 0.255419 0.140028 0.067753  
 0.0290036 0.014034  
 Year 25 Pred = 0.00783156 0.0725494 0.464405 0.208487 0.141728 0.0627791  
 0.0267152 0.0155045

Proportions of Discards at age by fleet  
 fleet 1

Year 1 Obs = 0 0 0 0 0 0 0 0  
 Year 1 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 2 Obs = 0 0 0 0 0 0 0 0  
 Year 2 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 3 Obs = 0 0 0 0 0 0 0 0  
 Year 3 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 4 Obs = 0 0 0 0 0 0 0 0  
 Year 4 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 5 Obs = 0 0 0 0 0 0 0 0  
 Year 5 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 6 Obs = 0 0 0 0 0 0 0 0  
 Year 6 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 7 Obs = 0 0 0 0 0 0 0 0  
 Year 7 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 8 Obs = 0 0 0 0 0 0 0 0  
 Year 8 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 9 Obs = 0 0 0 0 0 0 0 0  
 Year 9 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 10 Obs = 0 0 0 0 0 0 0 0  
 Year 10 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 11 Obs = 0 0 0 0 0 0 0 0  
 Year 11 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 12 Obs = 0 0 0 0 0 0 0 0  
 Year 12 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 13 Obs = 0 0 0 0 0 0 0 0  
 Year 13 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 14 Obs = 0 0 0 0 0 0 0 0  
 Year 14 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 15 Obs = 0 0 0 0 0 0 0 0  
 Year 15 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 16 Obs = 0 0 0 0 0 0 0 0  
 Year 16 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 17 Obs = 0 0 0 0 0 0 0 0  
 Year 17 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 18 Obs = 0 0 0 0 0 0 0 0  
 Year 18 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 19 Obs = 0 0 0 0 0 0 0 0  
 Year 19 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 20 Obs = 0 0 0 0 0 0 0 0  
 Year 20 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 21 Obs = 0 0 0 0 0 0 0 0  
 Year 21 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 22 Obs = 0 0 0 0 0 0 0 0  
 Year 22 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 23 Obs = 0 0 0 0 0 0 0 0  
 Year 23 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 24 Obs = 0 0 0 0 0 0 0 0  
 Year 24 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15

Year 25 Obs = 0 0 0 0 0 0 0 0  
 Year 25 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15

F Reference Points Using Final Year Selectivity and Freport options

refpt	F	slope to plot on SRR				
F0.1	0.150496	0.314039				
Fmax	0.280941	0.506466				
F30%SPR	0.23454	0.436015				
F40%SPR	0.159777	0.327007				
Fmsy	0.280937	0.506459	SSBmsy	65694.7	MSY	16712.6
Fcurrent	0.384466	0.666036				

Stock-Recruitment Relationship Parameters

alpha = 33271.7  
 beta = 0.0171332  
 unexpl = 269444  
 steepness = 1

Spawning Stock, Obs Recruits(year+1), Pred Recruits(year+1), standardized residual

Year	SS	Obs	Pred	Residual
init	xxxx	50033.9	33271.7	0.863699
1982	23028.1	79692.8	33271.7	1.84909
1983	20985.5	32813.6	33271.7	-0.0293473
1984	17756.9	58115.9	33271.7	1.18068
1985	14902.8	58915.4	33271.7	1.20961
1986	15047.3	45409.9	33271.7	0.658417
1987	15983.6	9484.77	33271.7	-2.6568
1988	9224.05	23150.6	33271.6	-0.767785
1989	5408.63	34556.9	33271.6	0.0802391
1990	7480.19	30155.8	33271.6	-0.208157
1991	7347.33	32022.3	33271.6	-0.0810195
1992	8459.78	29863.2	33271.6	-0.228796
1993	9320.08	39370.1	33271.6	0.356284
1994	12162.4	46100.1	33271.7	0.690353
1995	18524.2	31216.8	33271.7	-0.134955
1996	20952.1	30455.2	33271.7	-0.187244
1997	21391.5	31645.6	33271.7	-0.106076
1998	23275	23837	33271.7	-0.70593
1999	23246.8	30518.7	33271.7	-0.182834
2000	24171.5	32821.4	33271.7	-0.028848
2001	28086.2	35606.7	33271.7	0.143588
2002	32456.5	26245.3	33271.7	-0.502181
2003	36786.4	42249.9	33271.7	0.505727
2004	37365.9	21437.6	33271.7	-0.930519
2005	37693.1	22939.2	33271.7	-0.7872
2006	39173.3	xxxx	33271.7	

Root Mean Square Error computed from Standardized Residuals

Component	#resids	RMSE
_Catch_Fleet_1	25	0.478577
Catch_Fleet_Total	25	0.478577
_Discard_Fleet_1	0	0
Discard_Fleet_Total	0	0
_Index_1	15	2.9409
_Index_2	25	2.08431
_Index_3	25	1.39818
_Index_4	25	3.27278
_Index_5	25	3.85238

_Index_6	23	1.61452
_Index_7	23	1.49045
_Index_8	25	2.15759
_Index_9	17	2.05723
_Index_10	19	1.07253
_Index_11	21	2.24145
_Index_12	25	1.50986
_Index_13	25	1.52569
Index_Total	293	2.23831
Nyear1	7	0.677861
Fmult_Year1	1	0.0214614
_Fmult_devs_Fleet_1	0	0
Fmult_devs_Total	0	0
Recruit_devs	0	0
Fleet_Sel_params	4	1.71411
Index_Sel_params	68	0.728852
q_year1	0	0
q_devs	0	0
SRR_steepness	0	0
SRR_unexpl_S	0	0

Projections not requested

that's all

**ASAP ALTERNATIVE RUN (F08 MULTI SVAge.REP)**

Age Structured Assessment Program (ASAP) Version 2.0  
Start time for run: Fri Mar 28 13:51:17 2008

obj\_fun = 45830.2

Component	Lambda	obj_fun
__Catch_Fleet_1	10	1976.54
__Catch_Fleet_2	10	1543.55
__Catch_Fleet_3	10	3265.42
__Catch_Fleet_4	10	1171.79
__Catch_Fleet_5	10	1803.36
__Catch_Fleet_6	10	1211.4
Catch_Fleet_Total	60	10972.1
Discard_Fleet_Total	0	0
__Index_Fit_1	1	99.8189
__Index_Fit_2	1	76.6323
__Index_Fit_3	1	38.2846
__Index_Fit_4	1	674.6
__Index_Fit_5	1	792.804
__Index_Fit_6	1	13.0548
__Index_Fit_7	1	34.4386
__Index_Fit_8	1	182.317
__Index_Fit_9	1	32.3718
__Index_Fit_10	1	48.8763
__Index_Fit_11	1	36.7619
__Index_Fit_12	1	92.7366
__Index_Fit_13	1	20.4368
Index_Fit_Total	13	2143.13
Catch_Age_Comps	see_below	2472.97
Discard_Age_Comps	see_below	0
Survey_Age_Comps	see_below	29484.6
__Sel_Param_1	1	0.876883
__Sel_Param_2	1	7.80609
__Sel_Param_3	1	1.159
__Sel_Param_4	1	2.78348
__Sel_Param_5	0	0
__Sel_Param_6	0	0
__Sel_Param_7	0	0
__Sel_Param_8	0	0
__Sel_Param_9	1	27.1384
__Sel_Param_11	1	22.7558
__Sel_Param_12	1	16.4072
__Sel_Param_13	1	103.468
__Sel_Param_17	1	39.8586
__Sel_Param_18	1	52.679
__Sel_Param_20	1	13.3228
__Sel_Param_21	1	104.359
__Sel_Param_25	1	0.888378
__Sel_Param_26	1	9.53583
__Sel_Param_27	1	0.891698
__Sel_Param_28	1	3.97907
__Sel_Param_29	1	0.901386
__Sel_Param_30	1	4.58442
__Sel_Param_31	1	1.69186

__Sel_Param_32	1	0.698472
__Sel_Param_33	1	0.862118
__Sel_Param_34	1	3.27088
__Sel_Param_35	1	1.61987
__Sel_Param_36	1	0.424805
Sel_Params_Total	24	421.963
__Index_Sel_Param_1	1	1.31586
__Index_Sel_Param_3	1	0.881503
__Index_Sel_Param_4	1	5.79736
__Index_Sel_Param_5	1	0.289153
__Index_Sel_Param_6	1	5.60516
__Index_Sel_Param_9	1	0.442075
__Index_Sel_Param_10	1	0.168969
__Index_Sel_Param_17	1	0.168969
__Index_Sel_Param_18	1	0.443008
__Index_Sel_Param_25	1	0.728782
__Index_Sel_Param_26	1	0.357856
__Index_Sel_Param_27	1	0.168969
__Index_Sel_Param_31	1	0.867095
__Index_Sel_Param_32	1	3.55618
__Index_Sel_Param_35	1	0.168969
__Index_Sel_Param_36	1	0.760976
__Index_Sel_Param_41	1	0.888247
__Index_Sel_Param_42	1	2.14515
__Index_Sel_Param_43	1	1.40355
Index_Sel_Params_Total	19	26.1578
q_year1_Total	0	0
q_devs_Total	130000	0
__Fmult_year1_fleet_1	1	0.442467
__Fmult_year1_fleet_2	1	-0.818903
__Fmult_year1_fleet_3	1	119.098
__Fmult_year1_fleet_4	1	119.098
__Fmult_year1_fleet_5	1	-0.27683
__Fmult_year1_fleet_6	1	-2.15671
Fmult_year1_fleet_Total	6	235.386
Fmult_devs_fleet_Total	0	0
N_year_1	1	73.9121
Recruit_devs	0	0
SRR_steepness	0	0
SRR_unexpl_stock	0	0
Fmult_Max_penalty	1000	0
F_penalty	0	0

Input and Estimated effective sample sizes for fleet 1

1982	31	0.241008
1983	33	0.703232
1984	43	1.70392
1985	379	16.22
1986	39	1.71089
1987	46	4.03722
1988	663	73.8028
1989	92	0.68642
1990	2270	30.6753
1991	58	4.62533
1992	173	27.9117
1993	415	0.817513
1994	106	10.4028

1995	75	11.3122
1996	222	65.9931
1997	267	29.1057
1998	151	44.5803
1999	187	45.0792
2000	125	126.574
2001	215	53.2007
2002	61	52.8198
2003	236	540.394
2004	139	440.712
2005	368	44.8789
2006	194	380.616

Total 6588 2008.8

Input and Estimated effective sample sizes for fleet 2

1982	10	0.0957991
1983	10	0.404572
1984	10	2.50319
1985	10	0.599177
1986	10	0.756592
1987	10	3.91203
1988	10	0.611378
1989	10	0.579011
1990	10	0.619397
1991	10	0.766801
1992	10	0.246268
1993	10	0.679388
1994	10	0.753415
1995	10	6.29289
1996	10	25.1849
1997	10	11.9335
1998	10	6.88701
1999	10	22.2499
2000	10	7.01976
2001	10	27.8323
2002	10	7.90409
2003	10	8.73044
2004	10	20.8715
2005	10	25.1157
2006	10	8.37452

Total 250 190.924

Input and Estimated effective sample sizes for fleet 3

1982	0	0.27197
1983	0	0.00643108
1984	0	0.011243
1985	0	0.0657306
1986	0	0.0187932
1987	0	0.0216768
1988	0	0.0880965
1989	10	0.0778081
1990	10	0.14547
1991	10	0.363032
1992	10	0.0965035
1993	10	0.0163067
1994	10	0.162001
1995	10	0.0810745
1996	10	0.197019
1997	10	0.138381

1998	10	0.129164
1999	10	0.145954
2000	10	0.111016
2001	10	0.082808
2002	10	0.100124
2003	10	0.200913
2004	10	0.15029
2005	10	0.0913496
2006	10	0.172197

Total 180 2.94535

Input and Estimated effective sample sizes for fleet 4

1982	0	0.301304
1983	0	1.05703
1984	0	0.128103
1985	0	0.0455786
1986	0	0.241491
1987	0	0.0917117
1988	0	0.0573292
1989	0	0.285143
1990	0	0.0652916
1991	0	0.148446
1992	0	0.10273
1993	0	0.436069
1994	10	0.0666308
1995	10	0.378404
1996	10	0.0578331
1997	10	0.314728
1998	10	0.280872
1999	10	0.306507
2000	10	0.289745
2001	10	0.150844
2002	10	0.269742
2003	10	0.276941
2004	10	0.713166
2005	10	0.838495
2006	10	0.591872

Total 130 7.49601

Input and Estimated effective sample sizes for fleet 5

1982	10	0.128276
1983	10	0.49279
1984	10	4.03153
1985	10	0.824078
1986	10	1.02304
1987	10	4.90925
1988	10	0.708588
1989	10	0.891267
1990	10	0.855972
1991	10	1.18493
1992	10	0.281373
1993	10	0.977105
1994	10	1.50332
1995	10	34.912
1996	10	772.296
1997	10	31.7885
1998	10	15.5305
1999	10	8.66238
2000	10	24.0074



2001	10	29.143
2002	10	8.7636
2003	10	9.70986
2004	10	13.9248
2005	10	10.4823
2006	10	8.69858

Total 250 985.73

Input and Estimated effective sample sizes for fleet 6

1982	10	0.474685
1983	10	27.8293
1984	10	11.3501
1985	10	2.69443
1986	10	12.7006
1987	10	6.74465
1988	10	1.7653
1989	10	24.0472
1990	10	4.52262
1991	10	4.46393
1992	10	2.09493
1993	10	10.5111
1994	10	4.8728
1995	10	6.83062
1996	10	2.59822
1997	10	23.1824
1998	10	19.6278
1999	10	8.65241
2000	10	13.7124
2001	10	99.7269
2002	10	42.3543
2003	10	348.973
2004	10	58.3459
2005	10	52.3199
2006	10	222.82

Total 250 1013.22

Input and Estimated effective Discard sample sizes for fleet 1

1982	0	1e+15
1983	0	1e+15
1984	0	1e+15
1985	0	1e+15
1986	0	1e+15
1987	0	1e+15
1988	0	1e+15
1989	0	1e+15
1990	0	1e+15
1991	0	1e+15
1992	0	1e+15
1993	0	1e+15
1994	0	1e+15
1995	0	1e+15
1996	0	1e+15
1997	0	1e+15
1998	0	1e+15
1999	0	1e+15
2000	0	1e+15
2001	0	1e+15
2002	0	1e+15

2003 0 1e+15  
2004 0 1e+15  
2005 0 1e+15  
2006 0 1e+15

Total 0 2.5e+16

Input and Estimated effective Discard sample sizes for fleet 2

1982 0 1e+15  
1983 0 1e+15  
1984 0 1e+15  
1985 0 1e+15  
1986 0 1e+15  
1987 0 1e+15  
1988 0 1e+15  
1989 0 1e+15  
1990 0 1e+15  
1991 0 1e+15  
1992 0 1e+15  
1993 0 1e+15  
1994 0 1e+15  
1995 0 1e+15  
1996 0 1e+15  
1997 0 1e+15  
1998 0 1e+15  
1999 0 1e+15  
2000 0 1e+15  
2001 0 1e+15  
2002 0 1e+15  
2003 0 1e+15  
2004 0 1e+15  
2005 0 1e+15  
2006 0 1e+15

Total 0 2.5e+16

Input and Estimated effective Discard sample sizes for fleet 3

1982 0 1e+15  
1983 0 1e+15  
1984 0 1e+15  
1985 0 1e+15  
1986 0 1e+15  
1987 0 1e+15  
1988 0 1e+15  
1989 0 1e+15  
1990 0 1e+15  
1991 0 1e+15  
1992 0 1e+15  
1993 0 1e+15  
1994 0 1e+15  
1995 0 1e+15  
1996 0 1e+15  
1997 0 1e+15  
1998 0 1e+15  
1999 0 1e+15  
2000 0 1e+15  
2001 0 1e+15  
2002 0 1e+15  
2003 0 1e+15  
2004 0 1e+15  
2005 0 1e+15

2006 0 1e+15  
 Total 0 2.5e+16  
 Input and Estimated effective Discard sample sizes for fleet 4  
 1982 0 1e+15  
 1983 0 1e+15  
 1984 0 1e+15  
 1985 0 1e+15  
 1986 0 1e+15  
 1987 0 1e+15  
 1988 0 1e+15  
 1989 0 1e+15  
 1990 0 1e+15  
 1991 0 1e+15  
 1992 0 1e+15  
 1993 0 1e+15  
 1994 0 1e+15  
 1995 0 1e+15  
 1996 0 1e+15  
 1997 0 1e+15  
 1998 0 1e+15  
 1999 0 1e+15  
 2000 0 1e+15  
 2001 0 1e+15  
 2002 0 1e+15  
 2003 0 1e+15  
 2004 0 1e+15  
 2005 0 1e+15  
 2006 0 1e+15  
 Total 0 2.5e+16  
 Input and Estimated effective Discard sample sizes for fleet 5  
 1982 0 1e+15  
 1983 0 1e+15  
 1984 0 1e+15  
 1985 0 1e+15  
 1986 0 1e+15  
 1987 0 1e+15  
 1988 0 1e+15  
 1989 0 1e+15  
 1990 0 1e+15  
 1991 0 1e+15  
 1992 0 1e+15  
 1993 0 1e+15  
 1994 0 1e+15  
 1995 0 1e+15  
 1996 0 1e+15  
 1997 0 1e+15  
 1998 0 1e+15  
 1999 0 1e+15  
 2000 0 1e+15  
 2001 0 1e+15  
 2002 0 1e+15  
 2003 0 1e+15  
 2004 0 1e+15  
 2005 0 1e+15  
 2006 0 1e+15  
 Total 0 2.5e+16  
 Input and Estimated effective Discard sample sizes for fleet 6

1982	0	1e+15
1983	0	1e+15
1984	0	1e+15
1985	0	1e+15
1986	0	1e+15
1987	0	1e+15
1988	0	1e+15
1989	0	1e+15
1990	0	1e+15
1991	0	1e+15
1992	0	1e+15
1993	0	1e+15
1994	0	1e+15
1995	0	1e+15
1996	0	1e+15
1997	0	1e+15
1998	0	1e+15
1999	0	1e+15
2000	0	1e+15
2001	0	1e+15
2002	0	1e+15
2003	0	1e+15
2004	0	1e+15
2005	0	1e+15
2006	0	1e+15
Total	0	2.5e+16

Observed and predicted total fleet catch by year and standardized residual  
fleet 1 total catches

1982	7536	5970.07	2.33513
1983	10201	7852.01	2.62369
1984	11455	10788.6	0.600826
1985	10767	10416.3	0.331967
1986	9500	9559.79	-0.0628995
1987	9945	9774.71	0.173149
1988	11616	7893.64	3.87289
1989	6218	5589.29	1.06862
1990	2962	3466.26	-1.57603
1991	4629	4799.79	-0.363218
1992	6361	6927.82	-0.855725
1993	4401	4194.5	0.481776
1994	4969	4676.68	0.60781
1995	4911	4774.55	0.282472
1996	3947	3961.81	-0.037536
1997	3313	3376.72	-0.190968
1998	3730	3744.53	-0.038987
1999	3551	3563.09	-0.0340601
2000	3564	3576.5	-0.0351064
2001	3705	3691.18	0.0374708
2002	4723	4729.67	-0.0141448
2003	4835	4829.28	0.0118693
2004	6036	5986.71	0.0822069
2005	5984	5949.51	0.0579491
2006	4481	4478.2	0.00625614

fleet 2 total catches

1982	2864	2733.18	0.468694
1983	3201	3131.21	0.220985

1984	5674	5562.43	0.199092
1985	3907	3894.24	0.032792
1986	2687	2689.71	-0.0100884
1987	2326	2319.01	0.0301855
1988	3071	2830.39	0.817923
1989	1908	1940.74	-0.170582
1990	1237	1270.48	-0.26771
1991	1595	1613.21	-0.113816
1992	1168	1168.03	-0.000228875
1993	1313	1295.96	0.130937
1994	1620	1617.01	0.0185363
1995	2066	2047.66	0.0893968
1996	1913	1919.51	-0.0340733
1997	681	683.504	-0.0367987
1998	1346	1347.61	-0.0120205
1999	1271	1272.21	-0.00955747
2000	1521	1523.05	-0.013485
2001	1265	1263.49	0.0119431
2002	1850	1850.92	-0.00495953
2003	1614	1613.35	0.00403255
2004	2193	2186.47	0.0298806
2005	1841	1837.53	0.0189247
2006	1781	1780.52	0.00267546
fleet 3 total catches			
1982	0	2.17813e-05	-11.5918
1983	0	9.67825e-10	-0.00097019
1984	0	1.11636e-14	-1.11914e-08
1985	0	9.4865e-12	-9.51014e-06
1986	0	3.63228e-17	-3.64171e-11
1987	0	4.08966e-11	-4.09985e-05
1988	0	3.69612e-05	-15.5059
1989	709	214.057	12.006
1990	1214	1253.39	-0.320129
1991	1052	1047.28	0.0451271
1992	690	707.962	-0.257627
1993	846	827.937	0.216359
1994	434	432.886	0.0257655
1995	138	138.233	-0.016891
1996	355	356.58	-0.0445213
1997	239	238.927	0.00306082
1998	254	253.852	0.00586163
1999	1181	1171.09	0.084503
2000	592	591.019	0.0166176
2001	230	230.191	-0.0083295
2002	307	306.917	0.00272334
2003	445	445.298	-0.00671081
2004	170	170.058	-0.00341487
2005	153	152.946	0.00356469
2006	214	213.987	0.000589446
fleet 4 total catches			
1982	0	1.63688e-05	-9.72013
1983	0	8.9278e-08	-0.0891034
1984	0	1.16555e-08	-0.0116777
1985	0	1.92838e-12	-1.93319e-06
1986	0	7.7355e-14	-7.75478e-08
1987	0	4.43064e-20	-5.34235e-14
1988	0	1.1571e-13	-1.15999e-07

1989	0	1.96311e-20	-1.78078e-14
1990	0	4.10018e-18	-4.11361e-12
1991	0	3.59114e-16	-3.60003e-10
1992	0	2.08148e-10	-0.000208665
1993	0	1.39522e-05	-8.75652
1994	472	281.954	5.16521
1995	170	169.563	0.0257992
1996	108	108.092	-0.00851767
1997	86	86.0848	-0.00988289
1998	135	134.961	0.00290376
1999	367	366.883	0.00320173
2000	134	133.929	0.0052939
2001	238	237.673	0.0137981
2002	142	142.142	-0.010045
2003	83	83.02	-0.00241633
2004	74	74.0023	-0.000317263
2005	77	77.0006	-8.14275e-05
2006	74	73.998	0.000273206

fleet 5 total catches

1982	8267	7254.89	1.30922
1983	12687	11556.8	0.935381
1984	8512	8248.25	0.315544
1985	5665	5634.13	0.0547801
1986	8102	8124.26	-0.0275096
1987	5519	5476.03	0.0783624
1988	6634	5627.63	1.64929
1989	1435	1446.46	-0.0797169
1990	2329	2457.24	-0.537335
1991	3611	3709.92	-0.270917
1992	3242	3243.27	-0.00391181
1993	4006	3854.68	0.386
1994	4231	4198.86	0.0764339
1995	2459	2453.92	0.0207208
1996	4454	4574.9	-0.268497
1997	5382	5568.94	-0.34229
1998	5659	5663	-0.00708688
1999	3795	3791.77	0.00854194
2000	7470	7462.25	0.0104058
2001	5279	5251.1	0.053117
2002	3632	3648.82	-0.0463236
2003	5279	5293.14	-0.0268084
2004	4831	4814.65	0.033981
2005	4724	4705.24	0.039887
2006	4992	4989.97	0.00407941

fleet 6 total catches

1982	296	290.549	0.186339
1983	376	372.901	0.0829626
1984	415	414.238	0.0184242
1985	92	91.9744	0.00279134
1986	578	578.343	-0.00595467
1987	522	521.655	0.00662919
1988	341	334.757	0.18523
1989	45	45.0033	-0.000724943
1990	234	236.525	-0.107597
1991	429	430.001	-0.0233546
1992	344	345.698	-0.0493633
1993	910	898.999	0.121935

1994	687	682.235	0.0697731
1995	752	754.903	-0.0386219
1996	681	685.599	-0.0674722
1997	556	557.789	-0.0322068
1998	734	733.421	0.00791784
1999	711	709.573	0.0201415
2000	952	949.788	0.0233239
2001	1274	1273.05	0.00744881
2002	777	778.599	-0.0206129
2003	882	883.837	-0.0208526
2004	1034	1035.86	-0.0180007
2005	999	998.876	0.00124593
2006	795	795.002	-2.65654e-05

Observed and predicted total fleet Discards by year and standardized residual

fleet 1 total Discards

1982	0	0	0
1983	0	0	0
1984	0	0	0
1985	0	0	0
1986	0	0	0
1987	0	0	0
1988	0	0	0
1989	0	0	0
1990	0	0	0
1991	0	0	0
1992	0	0	0
1993	0	0	0
1994	0	0	0
1995	0	0	0
1996	0	0	0
1997	0	0	0
1998	0	0	0
1999	0	0	0
2000	0	0	0
2001	0	0	0
2002	0	0	0
2003	0	0	0
2004	0	0	0
2005	0	0	0
2006	0	0	0

fleet 2 total Discards

1982	0	0	0
1983	0	0	0
1984	0	0	0
1985	0	0	0
1986	0	0	0
1987	0	0	0
1988	0	0	0
1989	0	0	0
1990	0	0	0
1991	0	0	0
1992	0	0	0
1993	0	0	0
1994	0	0	0
1995	0	0	0
1996	0	0	0
1997	0	0	0

1998	0	0	0
1999	0	0	0
2000	0	0	0
2001	0	0	0
2002	0	0	0
2003	0	0	0
2004	0	0	0
2005	0	0	0
2006	0	0	0

fleet 3 total Discards

1982	0	0	0
1983	0	0	0
1984	0	0	0
1985	0	0	0
1986	0	0	0
1987	0	0	0
1988	0	0	0
1989	0	0	0
1990	0	0	0
1991	0	0	0
1992	0	0	0
1993	0	0	0
1994	0	0	0
1995	0	0	0
1996	0	0	0
1997	0	0	0
1998	0	0	0
1999	0	0	0
2000	0	0	0
2001	0	0	0
2002	0	0	0
2003	0	0	0
2004	0	0	0
2005	0	0	0
2006	0	0	0

fleet 4 total Discards

1982	0	0	0
1983	0	0	0
1984	0	0	0
1985	0	0	0
1986	0	0	0
1987	0	0	0
1988	0	0	0
1989	0	0	0
1990	0	0	0
1991	0	0	0
1992	0	0	0
1993	0	0	0
1994	0	0	0
1995	0	0	0
1996	0	0	0
1997	0	0	0
1998	0	0	0
1999	0	0	0
2000	0	0	0
2001	0	0	0
2002	0	0	0



2003	0	0	0
2004	0	0	0
2005	0	0	0
2006	0	0	0

	fleet 5	total	Discards
1982	0	0	0
1983	0	0	0
1984	0	0	0
1985	0	0	0
1986	0	0	0
1987	0	0	0
1988	0	0	0
1989	0	0	0
1990	0	0	0
1991	0	0	0
1992	0	0	0
1993	0	0	0
1994	0	0	0
1995	0	0	0
1996	0	0	0
1997	0	0	0
1998	0	0	0
1999	0	0	0
2000	0	0	0
2001	0	0	0
2002	0	0	0
2003	0	0	0
2004	0	0	0
2005	0	0	0
2006	0	0	0

	fleet 6	total	Discards
1982	0	0	0
1983	0	0	0
1984	0	0	0
1985	0	0	0
1986	0	0	0
1987	0	0	0
1988	0	0	0
1989	0	0	0
1990	0	0	0
1991	0	0	0
1992	0	0	0
1993	0	0	0
1994	0	0	0
1995	0	0	0
1996	0	0	0
1997	0	0	0
1998	0	0	0
1999	0	0	0
2000	0	0	0
2001	0	0	0
2002	0	0	0
2003	0	0	0
2004	0	0	0
2005	0	0	0
2006	0	0	0

```

Index data
index number 1
units = 2
month = 1
starting and ending ages for selectivity = 2 8
selectivity choice = -1
  year, obs index, pred index, standardized residual
1992 12.3 5.48081 5.08426
1993 13.6 7.08226 4.10389
1994 12.05 8.96872 1.85748
1995 10.93 11.6494 -0.400916
1996 31.25 16.0097 4.20671
1997 10.28 17.4853 -3.34084
1998 7.76 18.8163 -5.57106
1999 11.06 19.6273 -3.6077
2000 15.77 19.6145 -1.37215
2001 18.6 18.4942 0.035871
2002 22.68 19.9931 0.793115
2003 35.64 22.4528 2.90618
2004 17.77 22.585 -1.50812
2005 12.89 22.6145 -3.53568
2006 21.06 19.9067 0.354241
index number 2
units = 2
month = 1
starting and ending ages for selectivity = 2 8
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982 2.27 0.455855 7.72779
1983 0.95 0.861621 0.470048
1984 0.66 1.83504 -4.92245
1985 2.38 1.55713 2.04225
1986 2.14 1.23156 2.6597
1987 0.93 1.50131 -2.30533
1988 1.5 1.12558 1.38233
1989 0.32 0.621465 -3.19516
1990 0.72 0.696578 0.159201
1991 1.08 0.845711 1.17715
1992 1.2 0.62016 3.17755
1993 1.27 0.664527 3.11785
1994 0.93 1.07545 -0.699471
1995 1.09 1.33639 -0.98103
1996 1.76 1.94962 -0.492546
1997 1.06 2.26412 -3.65324
1998 1.19 2.27324 -3.11571
1999 1.6 2.3008 -1.74862
2000 2.14 2.3343 -0.418354
2001 2.69 2.10003 1.19184
2002 2.47 2.32527 0.290656
2003 2.91 2.61708 0.510717
2004 3.03 2.6683 0.611926
2005 1.81 2.48403 -1.52381
2006 1.77 2.39662 -1.45894
index number 3
units = 2
month = 1
starting and ending ages for selectivity = 1 5

```

```

selectivity choice = -1
  year, obs index, pred index, standardized residual
1982  2.5  1.07036  2.80043
1983  2.89  2.915  -0.0284315
1984  2.08  3.46954  -1.68909
1985  1.9  2.25511  -0.565653
1986  1.44  2.58739  -1.93455
1987  0.9  2.33275  -3.14413
1988  0.89  1.46489  -1.64505
1989  0.57  1.22674  -2.53032
1990  0.89  1.23419  -1.07933
1991  1.7  1.42947  0.572184
1992  2.32  1.26798  1.99441
1993  1.07  1.63066  -1.3909
1994  1.53  1.74126  -0.42698
1995  2.4  2.05544  0.511627
1996  1.96  2.54451  -0.8616
1997  2.91  2.4249  0.602023
1998  4.51  2.44389  2.02269
1999  3.78  2.45719  1.42186
2000  3.19  2.27132  1.1213
2001  2.89  2.24543  0.833106
2002  2.55  2.42939  0.159957
2003  2.87  2.54297  0.399379
2004  4.07  2.42853  1.70461
2005  2.49  2.41209  0.104939
2006  2.77  2.01475  1.05096
index number 4
units = 2
month = 1
starting and ending ages for selectivity = 3 4
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982  1.726  0.020156  21.4215
1983  1.049  0.00928056  22.7578
1984  0.145  0.833704  -8.41994
1985  1.296  1.66026  -1.19232
1986  0.707  0.774766  -0.440605
1987  0.653  1.0141  -2.1189
1988  1.128  1.28137  -0.613691
1989  0.465  0.358562  1.25126
1990  0.102  0.532544  -7.95564
1991  0.062  0.643778  -11.2652
1992  0.432  0.499167  -0.695656
1993  0.557  0.151569  6.26519
1994  1.265  0.905274  1.61063
1995  1.355  1.23149  0.460075
1996  0.8  1.81326  -3.93895
1997  1.46  2.62503  -2.82402
1998  1.871  2.69579  -1.75807
1999  1.99  2.37221  -0.845713
2000  2.864  2.56205  0.536297
2001  1.756  2.12303  -0.913681
2002  1.908  2.30589  -0.911769
2003  2.064  2.76895  -1.41439
2004  0.606  2.97883  -7.66544
2005  1.38  2.41771  -2.69926

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2006  3.415  2.55862  1.38978
index number 5
units = 2
month = 1
starting and ending ages for selectivity = 3  4
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982  1.682  0.0175228  21.9711
1983  0.779  0.00739608  22.4179
1984  0.394  0.817284  -3.51228
1985  1.935  1.52009  1.16175
1986  0.893  0.598128  1.92926
1987  0.674  0.935341  -1.57738
1988  0.435  1.12501  -4.57404
1989  0.333  0.270861  0.994208
1990  0.011  0.495354  -18.3277
1991  0.294  0.523058  -2.77326
1992  0.186  0.433915  -4.07773
1993  0.508  0.130559  6.54021
1994  0.076  0.865006  -11.707
1995  0.506  1.00775  -3.31639
1996  1.396  1.66169  -0.838657
1997  1.859  2.28206  -0.987014
1998  0.852  2.06709  -4.26648
1999  1.319  1.88874  -1.72831
2000  2.797  2.02928  1.54457
2001  1.39  1.6199  -0.736787
2002  1.48  1.87588  -1.14104
2003  1.51  2.16977  -1.74503
2004  1.591  2.31309  -1.80141
2005  3.399  1.76156  3.16397
2006  4.304  2.12704  3.39279
index number 6
units = 2
month = 1
starting and ending ages for selectivity = 3  5
selectivity choice = -1
  year, obs index, pred index, standardized residual
1984  0.315  0.234541  0.76558
1985  0.423  0.458818  -0.210985
1986  0.19  0.217245  -0.347829
1987  0.104  0.301022  -2.75869
1988  0.267  0.358746  -0.766677
1989  0.089  0.104698  -0.421651
1990  0.041  0.158314  -3.5068
1991  0.246  0.178726  0.829269
1992  0.213  0.149582  0.917444
1993  0.184  0.0437486  3.72865
1994  0.357  0.256317  0.860006
1995  0.076  0.336891  -3.86506
1996  0.375  0.516544  -0.831232
1997  0.6  0.730271  -0.510018
1998  1.213  0.78147  1.14126
1999  1.117  0.768707  0.96999
2000  1.324  0.80793  1.28211
2001  0.825  0.682308  0.492929
2002  1.962  0.752256  2.48835

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2003  1.643  0.853245  1.70078
2004  1.422  0.962644  1.01267
2005  0.447  0.811039  -1.54641
2006  0.493  0.852492  -1.42154
index number 7
units = 2
month = 1
starting and ending ages for selectivity = 1 8
selectivity choice = -1
  year, obs index, pred index, standardized residual
1984  0.999  2.19887  -2.04785
1985  1.191  1.46491  -0.537318
1986  1.719  1.48811  0.37439
1987  1.401  1.59613  -0.338475
1988  1.42  1.00341  0.901358
1989  0.14  0.740873  -4.32491
1990  0.87  0.75219  0.377684
1991  1.26  0.916791  0.825399
1992  1.02  0.700082  0.976918
1993  1.109  0.919455  0.486519
1994  0.55  1.10917  -1.82076
1995  0.541  1.35342  -2.38018
1996  2.191  1.84207  0.450273
1997  2.5  1.90649  0.703505
1998  1.719  1.91252  -0.276911
1999  2.68  1.96056  0.811385
2000  1.91  1.8941  0.0217017
2001  4.417  1.79349  2.33949
2002  6.121  1.96374  2.95099
2003  3.388  2.15956  1.16894
2004  1.954  2.09724  -0.183624
2005  2.41  2.07279  0.391246
2006  1.316  1.83775  -0.866813
index number 8
units = 2
month = 1
starting and ending ages for selectivity = 3 4
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982  0.59  0.012535  9.99757
1983  0.53  0.00520795  11.9991
1984  0.59  0.596057  -0.0265112
1985  0.3  1.09687  -3.36514
1986  0.64  0.418574  1.10217
1987  0.39  0.675729  -1.42671
1988  0.24  0.806146  -3.14501
1989  0.07  0.188724  -2.57438
1990  0.12  0.358349  -2.83973
1991  0.09  0.369657  -3.66711
1992  0.52  0.310399  1.3393
1993  0.29  0.0932474  2.94514
1994  0.03  0.628407  -7.89608
1995  0.2  0.713151  -3.3001
1996  1.04  1.19922  -0.369755
1997  0.99  1.63248  -1.29825
1998  0.45  1.4446  -3.02747
1999  2.26  1.32972  1.37675

```

2000	1.69	1.42723	0.438648
2001	0.93	1.13096	-0.507815
2002	1.78	1.32605	0.764205
2003	2.57	1.52287	1.35834
2004	2.08	1.62058	0.647849
2005	2.07	1.21818	1.37621
2006	1.57	1.50959	0.101846

index number 9  
units = 2  
month = 1  
starting and ending ages for selectivity = 1 8  
selectivity choice = -1

year	obs index	pred index	standardized residual
1990	0.29	0.326862	-0.31059
1991	0.15	0.390696	-2.48484
1992	0.34	0.312163	0.221722
1993	0.26	0.356115	-0.81653
1994	0.17	0.48488	-2.72055
1995	0.08	0.597296	-5.21835
1996	0.96	0.814881	0.42541
1997	0.73	0.899529	-0.542052
1998	0.43	0.919792	-1.97367
1999	0.9	0.929709	-0.084299
2000	2.61	0.929861	2.67894
2001	0.98	0.860493	0.337562
2002	2.03	0.942675	1.99108
2003	3.78	1.0425	3.34351
2004	2.17	1.05416	1.87405
2005	2.49	1.00105	2.36529
2006	1.32	0.927903	0.914878

index number 10  
units = 2  
month = 1  
starting and ending ages for selectivity = 1 8  
selectivity choice = -1

year	obs index	pred index	standardized residual
1988	4.26	5.88488	-0.838714
1989	1.69	4.39393	-2.48018
1990	2.86	4.79774	-1.34281
1991	3.97	5.05149	-0.625349
1992	4.75	5.56706	-0.411994
1993	8.46	5.81988	0.970969
1994	2.83	6.52782	-2.16947
1995	8.37	7.45167	0.301662
1996	9.69	8.26943	0.411494
1997	16.35	8.13913	1.81061
1998	9.47	8.46636	0.29079
1999	11.44	8.15948	0.877178
2000	7.35	8.08929	-0.248772
2001	5.68	7.98697	-0.884769
2002	16.84	8.6326	1.73447
2003	9.84	8.60594	0.347832
2004	10.66	8.94796	0.454436
2005	11.19	8.10941	0.835802
2006	10.65	7.33559	0.967731

index number 11  
units = 2

```

month = 1
starting and ending ages for selectivity = 1 1
selectivity choice = -1
  year, obs index, pred index, standardized residual
1986 0.32 0.38262 -0.463904
1987 0.26 0.119271 2.02278
1988 0.01 0.215559 -7.97047
1989 0.14 0.138853 0.0213615
1990 0.36 0.179477 1.80675
1991 0.38 0.146507 2.47396
1992 0.37 0.261448 0.9014
1993 0.05 0.193841 -3.51721
1994 0.57 0.22229 2.44424
1995 0.3 0.225908 0.736285
1996 0.08 0.157849 -1.76407
1997 0.22 0.152806 0.946018
1998 0.39 0.174819 2.08277
1999 0.35 0.128662 2.59764
2000 0.21 0.153688 0.810333
2001 0.14 0.161208 -0.366126
2002 0.13 0.170931 -0.710506
2003 0.21 0.115053 1.56187
2004 0.27 0.176284 1.10661
2005 0.01 0.0895175 -5.68937
2006 0.17 0.116876 0.972568

```

index number 12

units = 2

month = 1

starting and ending ages for selectivity = 1 1

selectivity choice = -1

```

  year, obs index, pred index, standardized residual
1982 3.408 17.9581 -4.31382
1983 17.699 27.7909 -1.17118
1984 13.31 10.019 0.737262
1985 12.843 15.0264 -0.407546
1986 59.526 16.2027 3.37761
1987 7.584 5.05074 1.05516
1988 1.763 9.12821 -4.26824
1989 2.855 5.87995 -1.87533
1990 4.733 7.60026 -1.22938
1991 7.337 6.20409 0.435355
1992 8.487 11.0715 -0.69003
1993 4.145 8.20855 -1.77357
1994 22.311 9.41328 2.23998
1995 13.067 9.56645 0.809409
1996 6.493 6.6844 -0.0754105
1997 7.997 6.47085 0.549663
1998 14.983 7.40302 1.83004
1999 8.565 5.4484 1.1742
2000 9.874 6.50818 1.082
2001 13.543 6.82662 1.77816
2002 5.406 7.23837 -0.757647
2003 8.18 4.87211 1.345
2004 6.993 7.46506 -0.169559
2005 2.198 3.79078 -1.41471
2006 9.658 4.94932 1.73532

```

index number 13

```

units = 2
month = 1
starting and ending ages for selectivity = 1 1
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982 2.27 2.12047 0.176879
1983 5.01 3.28152 1.09831
1984 1.58 1.18303 0.751049
1985 1.26 1.7743 -0.88849
1986 1.26 1.9132 -1.08413
1987 0.39 0.596386 -1.1025
1988 0.54 1.07785 -1.79403
1989 1.24 0.694299 1.50541
1990 2.54 0.89743 2.70052
1991 2.64 0.732572 3.32761
1992 0.89 1.30731 -0.998054
1993 0.5 0.969257 -1.71815
1994 2.41 1.11151 2.00883
1995 0.63 1.1296 -1.51562
1996 0.81 0.789287 0.0672394
1997 0.89 0.764071 0.396002
1998 0.73 0.87414 -0.467735
1999 0.53 0.643341 -0.50304
2000 0.57 0.768479 -0.775535
2001 0.47 0.80608 -1.40025
2002 0.77 0.854698 -0.270882
2003 0.44 0.575294 -0.695922
2004 1.3 0.881466 1.00851
2005 0.35 0.447611 -0.638517
2006 0.8 0.58441 0.815071

```

Input and Estimated effective sample sizes for index 1

```

1992 100 43.808
1993 100 0.557621
1994 100 6.36623
1995 100 18.3641
1996 100 6.53857
1997 100 49.7465
1998 100 103.43
1999 100 28.5752
2000 100 17.5802
2001 100 31.5588
2002 100 17.0236
2003 100 107.507
2004 100 24.811
2005 100 81.0669
2006 100 245.687

```

Total 1500 782.621

Input and Estimated effective sample sizes for index 2

```

1982 200 0.0606725
1983 200 0.293579
1984 200 2.0214
1985 200 332.209
1986 200 33.4284
1987 200 348.478
1988 200 9.62086
1989 200 1.3145

```



1990	200	1.41036
1991	200	6.76998
1992	200	8.74047
1993	200	1.9755
1994	200	595.782
1995	200	3.65263
1996	200	3.73875
1997	200	69.8507
1998	200	218.949
1999	200	38.6778
2000	200	51.6254
2001	200	24.5799
2002	200	20.2172
2003	200	431.442
2004	200	231.349
2005	200	78.3861
2006	200	50.5252
Total	5000	2565.1

Input and Estimated effective sample sizes for index 3

1982	200	0.58047
1983	200	17.0632
1984	200	17.9177
1985	200	165.096
1986	200	270.859
1987	200	69.3924
1988	200	3.98785
1989	200	2.44251
1990	200	7.261
1991	200	5.98254
1992	200	175.091
1993	200	4889.34
1994	200	6.05223
1995	200	13.34
1996	200	73.9536
1997	200	145.684
1998	200	35.8999
1999	200	37.2363
2000	200	96.4518
2001	200	45.0888
2002	200	44.5106
2003	200	92.0734
2004	200	118.987
2005	200	895.183
2006	200	312.214

Total 5000 7541.69

Input and Estimated effective sample sizes for index 4

1982	100	8.39482
1983	100	75.2588
1984	100	0.007279
1985	100	10.49
1986	100	9.32903
1987	100	10.6897
1988	100	16.5352
1989	100	4.36532
1990	100	0.19391
1991	100	10.3053
1992	100	505.915

1993	100	11.6449
1994	100	258.151
1995	100	2.61214
1996	100	820.995
1997	100	16.682
1998	100	36.1991
1999	100	6.90336
2000	100	165.083
2001	100	363.932
2002	100	12.9416
2003	100	24.8506
2004	100	17.3341
2005	100	4.5544
2006	100	686.215
Total	2500	3079.58
Input and Estimated effective sample sizes for index 5		
1982	100	8.37857
1983	100	190.175
1984	100	0.00744726
1985	100	26.5766
1986	100	254.536
1987	100	26.7538
1988	100	9.84369
1989	100	3.40125
1990	100	0.0572045
1991	100	4.75626
1992	100	6.86439
1993	100	19.2885
1994	100	36.8234
1995	100	4.0852
1996	100	433.743
1997	100	28.9208
1998	100	199.245
1999	100	53.6636
2000	100	51.8603
2001	100	53.4689
2002	100	23.1804
2003	100	29.8531
2004	100	6.25595
2005	100	76.1243
2006	100	63.2604
Total	2500	1611.12
Input and Estimated effective sample sizes for index 6		
1984	100	0.108932
1985	100	6.42799
1986	100	78.7149
1987	100	126.549
1988	100	75.7512
1989	100	27.3127
1990	100	1.71234
1991	100	9.19794
1992	100	11.7058
1993	100	17.256
1994	100	19.3062
1995	100	115.552
1996	100	6.87779
1997	100	21.1447

1998	100	93.9813
1999	100	90.5935
2000	100	30.5635
2001	100	34.4762
2002	100	63.1121
2003	100	52.2532
2004	100	91.0283
2005	100	11.7648
2006	100	18.5144

Total 2300 1003.91

Input and Estimated effective sample sizes for index 7

1984	100	5.23319
1985	100	27.0258
1986	100	241.891
1987	100	21.2738
1988	100	5.41881
1989	100	0.830844
1990	100	7.17044
1991	100	76.0327
1992	100	23.6082
1993	100	17.7015
1994	100	7.57609
1995	100	13.982
1996	100	21.1072
1997	100	76.6199
1998	100	8.20103
1999	100	13.7323
2000	100	77.6332
2001	100	9.21016
2002	100	18.2604
2003	100	45.3026
2004	100	53.5258
2005	100	38.8581
2006	100	132.506

Total 2300 942.701

Input and Estimated effective sample sizes for index 8

1982	100	1186.22
1983	100	3076.57
1984	100	0.0230121
1985	100	1419.08
1986	100	158.295
1987	100	5931.68
1988	100	8.97249
1989	100	2.81165
1990	100	20.6031
1991	100	31.2626
1992	100	9.41173
1993	100	7.05119
1994	100	43.3997
1995	100	4.81478
1996	100	22.6548
1997	100	15.3148
1998	100	92.5184
1999	100	73.4836
2000	100	48.2867
2001	100	35.6999
2002	100	67.1358

2003	100	208.097
2004	100	8.4355
2005	100	305.25
2006	100	8.43741
Total	2500	12785.5
Input and Estimated effective sample sizes for index 9		
1990	100	7.26999
1991	100	7.14964
1992	100	23.6592
1993	100	1.66187
1994	100	9.1535
1995	100	5.0661
1996	100	49.8249
1997	100	121.29
1998	100	22.7625
1999	100	635.002
2000	100	141.918
2001	100	20.5765
2002	100	22.1646
2003	100	23.0369
2004	100	72.5359
2005	100	56.2258
2006	100	29.906
Total	1700	1249.2
Input and Estimated effective sample sizes for index 10		
1988	100	1.48793
1989	100	9.08255
1990	100	17.9709
1991	100	8.52108
1992	100	1.88521
1993	100	13.3611
1994	100	14.5023
1995	100	11.6114
1996	100	49.898
1997	100	12.2684
1998	100	4.73133
1999	100	14.0643
2000	100	8.43251
2001	100	7.76601
2002	100	9.02435
2003	100	9.83115
2004	100	4.05491
2005	100	10.1301
2006	100	5.59076
Total	1900	214.214
Input and Estimated effective sample sizes for index 11		
1986	0	0
1987	0	0
1988	0	0
1989	0	0
1990	0	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0

1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
Total	0	0

Input and Estimated effective sample sizes for index 12

1982	0	0
1983	0	0
1984	0	0
1985	0	0
1986	0	0
1987	0	0
1988	0	0
1989	0	0
1990	0	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0

Total 0 0

Input and Estimated effective sample sizes for index 13

1982	0	0
1983	0	0
1984	0	0
1985	0	0
1986	0	0
1987	0	0
1988	0	0
1989	0	0
1990	0	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0

2000 0 0  
 2001 0 0  
 2002 0 0  
 2003 0 0  
 2004 0 0  
 2005 0 0  
 2006 0 0  
 Total 0 0

Survey proportions at age by index

Index number 1

Year 1992 Obs = -1 0.581582 0.385385 0.027027 0.003003 0.001001 0.002002 0  
 Year 1992 Pred = -1 0.537365 0.314276 0.0980548 0.0436503 0.00386281  
 0.0023173 0.000474207  
 Year 1993 Obs = -1 0.478 0.493 0.023 0.004 0.001 0.001 0  
 Year 1993 Pred = -1 0.893863 0.0723216 0.0246687 0.00626094 0.00253299  
 0.000206141 0.000146787  
 Year 1994 Obs = -1 0.311688 0.597403 0.0679321 0.021978 0 0 0.000999001  
 Year 1994 Pred = -1 0.538861 0.427038 0.0248372 0.00697561 0.00159757  
 0.000608286 8.25858e-05  
 Year 1995 Obs = -1 0.555 0.42 0.023 0.002 0 0 0  
 Year 1995 Pred = -1 0.506976 0.316061 0.165698 0.00847162 0.00214131  
 0.000458027 0.000194004  
 Year 1996 Obs = -1 0.709 0.267 0.019 0.004 0.001 0 0  
 Year 1996 Pred = -1 0.472151 0.439108 0.0705333 0.017222 0.000752887  
 0.000179613 5.36199e-05  
 Year 1997 Obs = -1 0.375 0.467 0.101 0.042 0.011 0.004 0  
 Year 1997 Pred = -1 0.302847 0.518141 0.161536 0.0142899 0.00302279  
 0.0001249 3.78952e-05  
 Year 1998 Obs = -1 0.216216 0.419419 0.295295 0.0540541 0.013013 0.001001  
 0.001001  
 Year 1998 Pred = -1 0.273668 0.361564 0.295673 0.0631165 0.00493703  
 0.000988716 5.21081e-05  
 Year 1999 Obs = -1 0.191191 0.434434 0.262262 0.0760761 0.025025 0.00500501  
 0.00600601  
 Year 1999 Pred = -1 0.299996 0.337169 0.215197 0.122377 0.0231886 0.00171769  
 0.000355397  
 Year 2000 Obs = -1 0.044044 0.413413 0.315315 0.159159 0.049049 0.011011  
 0.00800801  
 Year 2000 Pred = -1 0.221258 0.359498 0.237782 0.112644 0.0577043 0.0102113  
 0.000902332  
 Year 2001 Obs = -1 0.165 0.287 0.345 0.131 0.043 0.02 0.009  
 Year 2001 Pred = -1 0.279685 0.285787 0.241079 0.115825 0.0492584 0.0238481  
 0.00451774  
 Year 2002 Obs = -1 0.122 0.474 0.246 0.1 0.037 0.014 0.007  
 Year 2002 Pred = -1 0.271544 0.33982 0.18611 0.118634 0.0513998 0.0207585  
 0.0117349  
 Year 2003 Obs = -1 0.229 0.403 0.238 0.075 0.029 0.011 0.015  
 Year 2003 Pred = -1 0.257022 0.329992 0.234531 0.0918575 0.0520456 0.0213522  
 0.0132008  
 Year 2004 Obs = -1 0.082 0.488 0.257 0.092 0.035 0.023 0.023  
 Year 2004 Pred = -1 0.172008 0.344461 0.259843 0.134907 0.0471033 0.0252722  
 0.016406  
 Year 2005 Obs = -1 0.22977 0.312687 0.237762 0.103896 0.0539461 0.025974  
 0.035964  
 Year 2005 Pred = -1 0.262937 0.232891 0.259945 0.139669 0.0646131 0.0214249  
 0.0185202

Year 2006 Obs = -1 0.125 0.43 0.204 0.117 0.063 0.027 0.034  
Year 2006 Pred = -1 0.151531 0.399401 0.185364 0.145149 0.0695303 0.0305718  
0.018453  
Index number 2  
Year 1982 Obs = -1 0.308 0.63 0.053 0.009 0 0 0  
Year 1982 Pred = -1 0.0121701 0.0246488 0.00518885 0.957571 0.000175522  
0.000230868 1.43969e-05  
Year 1983 Obs = -1 0.336327 0.41018 0.199601 0.0319361 0.010978 0 0.010978  
Year 1983 Pred = -1 0.913533 0.00486505 0.00208339 0.000429736 0.079055  
1.43779e-05 1.983e-05  
Year 1984 Obs = -1 0.258 0.5 0.136 0.076 0 0.015 0.015  
Year 1984 Pred = -1 0.667018 0.326909 0.000363914 0.000150554 3.05695e-05  
0.00552583 2.3186e-06  
Year 1985 Obs = -1 0.231231 0.655656 0.0880881 0.017017 0.00800801 0 0  
Year 1985 Pred = -1 0.259011 0.666374 0.0733595 7.88576e-05 3.21071e-05  
6.409e-06 0.00113825  
Year 1986 Obs = -1 0.692 0.201 0.093 0.009 0.005 0 0  
Year 1986 Pred = -1 0.585649 0.261233 0.138159 0.0147185 1.56161e-05  
6.27488e-06 0.000217879  
Year 1987 Obs = -1 0.505 0.462 0.022 0.011 0 0 0  
Year 1987 Pred = -1 0.505739 0.428838 0.0416735 0.0214487 0.00226471  
2.37543e-06 3.31298e-05  
Year 1988 Obs = -1 0.4 0.54 0.047 0.013 0 0 0  
Year 1988 Pred = -1 0.209535 0.648954 0.123292 0.0116505 0.00593955  
0.000619922 9.45792e-06  
Year 1989 Obs = -1 0.187812 0.718282 0.0629371 0.030969 0 0 0  
Year 1989 Pred = -1 0.608735 0.225593 0.136773 0.0252312 0.00235817  
0.00118584 0.0001236  
Year 1990 Obs = -1 0.875 0.042 0.083 0 0 0 0  
Year 1990 Pred = -1 0.435843 0.494107 0.0408812 0.0241054 0.00442821  
0.000409149 0.000225875  
Year 1991 Obs = -1 0.731 0.25 0 0.019 0 0 0  
Year 1991 Pred = -1 0.485433 0.36111 0.134814 0.0108265 0.00649897 0.0011511  
0.000166784  
Year 1992 Obs = -1 0.642 0.342 0.008 0 0.008 0 0  
Year 1992 Pred = -1 0.417973 0.448613 0.0945238 0.0341934 0.00276903  
0.00160444 0.000324062  
Year 1993 Obs = -1 0.575 0.394 0.031 0 0 0 0  
Year 1993 Pred = -1 0.838432 0.124493 0.0286772 0.00591443 0.00218966  
0.000172117 0.000120966  
Year 1994 Obs = -1 0.376 0.57 0.043 0.011 0 0 0  
Year 1994 Pred = -1 0.395509 0.575211 0.0225931 0.0051563 0.00108065  
0.000397421 5.32557e-05  
Year 1995 Obs = -1 0.725 0.248 0.018 0 0 0 0.009  
Year 1995 Pred = -1 0.388949 0.444998 0.157549 0.00654559 0.00151401  
0.000312795 0.000130767  
Year 1996 Obs = -1 0.614 0.318 0.068 0 0 0 0  
Year 1996 Pred = -1 0.341234 0.582403 0.063177 0.0125352 0.000501472  
0.00011555 3.4047e-05  
Year 1997 Obs = -1 0.274 0.632 0.085 0.009 0 0 0  
Year 1997 Pred = -1 0.205842 0.646311 0.136074 0.00978174 0.0018935  
7.55679e-05 2.26296e-05  
Year 1998 Obs = -1 0.227227 0.437437 0.269269 0.0500501 0.00800801  
0.00800801 0  
Year 1998 Pred = -1 0.199366 0.483386 0.266951 0.046307 0.00331466  
0.000641154 3.33513e-05  
Year 1999 Obs = -1 0.137862 0.462537 0.2997 0.0809191 0.012987 0.00599401 0

Year 1999 Pred = -1 0.225234 0.464567 0.200239 0.0925324 0.016045 0.00114797  
0.000234431  
Year 2000 Obs = -1 0.0890891 0.481481 0.294294 0.0560561 0.0700701  
0.00900901 0  
Year 2000 Pred = -1 0.163627 0.487904 0.217936 0.0838958 0.0393287  
0.00672201 0.000586278  
Year 2001 Obs = -1 0.178 0.331 0.379 0.074 0.019 0.015 0.004  
Year 2001 Pred = -1 0.216779 0.406511 0.231581 0.0904122 0.0351864 0.0164538  
0.00307646  
Year 2002 Obs = -1 0.138 0.36 0.3 0.126 0.04 0.012 0.024  
Year 2002 Pred = -1 0.205486 0.471925 0.174544 0.0904124 0.0358468 0.0139831  
0.00780198  
Year 2003 Obs = -1 0.185814 0.442557 0.202797 0.0999001 0.044955 0.020979  
0.002997  
Year 2003 Pred = -1 0.194071 0.457274 0.219475 0.0698527 0.0362178 0.0143515  
0.00875739  
Year 2004 Obs = -1 0.0988024 0.478044 0.280439 0.0888224 0.0169661  
0.0199601 0.0169661  
Year 2004 Pred = -1 0.128136 0.470918 0.239899 0.101212 0.0323385 0.0167583  
0.0107376  
Year 2005 Obs = -1 0.144 0.359 0.32 0.083 0.055 0.028 0.011  
Year 2005 Pred = -1 0.210678 0.342453 0.258133 0.112705 0.0477126 0.0152809  
0.0130375  
Year 2006 Obs = -1 0.022977 0.587413 0.135864 0.140859 0.0509491 0.033966  
0.027972  
Year 2006 Pred = -1 0.110774 0.535831 0.167941 0.106863 0.0468443 0.019894  
0.0118518  
Index number 3  
Year 1982 Obs = 0.22 0.608 0.16 0.012 0 -1 -1 -1  
Year 1982 Pred = 0.726929 0.0112397 0.00665987 0.00137546 0.253796 -1 -1 -1  
Year 1983 Obs = 0.332 0.505 0.118 0.042 0.003 -1 -1 -1  
Year 1983 Pred = 0.413073 0.585553 0.000912297 0.00038329 7.90489e-05 -1 -1  
-1  
Year 1984 Obs = 0.0869131 0.667333 0.206793 0.033966 0.004995 -1 -1 -1  
Year 1984 Pred = 0.125116 0.765023 0.109691 0.000119799 4.95542e-05 -1 -1 -1  
Year 1985 Obs = 0.311 0.421 0.242 0.026 0 -1 -1 -1  
Year 1985 Pred = 0.288701 0.387829 0.291909 0.0315278 3.38858e-05 -1 -1 -1  
Year 1986 Obs = 0.271271 0.576577 0.0760761 0.0760761 0 -1 -1 -1  
Year 1986 Pred = 0.271323 0.604501 0.0788851 0.0409311 0.00435988 -1 -1 -1  
Year 1987 Obs = 0.0780781 0.644645 0.222222 0.033033 0.022022 -1 -1 -1  
Year 1987 Pred = 0.0938097 0.705815 0.175092 0.0166932 0.00859046 -1 -1 -1  
Year 1988 Obs = 0.067 0.697 0.202 0.034 0 -1 -1 -1  
Year 1988 Pred = 0.269987 0.349135 0.316343 0.0589642 0.00557103 -1 -1 -1  
Year 1989 Obs = 0.544 0.368 0.088 0 0 -1 -1 -1  
Year 1989 Pred = 0.207675 0.66874 0.0725042 0.0431265 0.00795461 -1 -1 -1  
Year 1990 Obs = 0.494 0.427 0.034 0.045 0 -1 -1 -1  
Year 1990 Pred = 0.266814 0.533436 0.176922 0.0143612 0.00846679 -1 -1 -1  
Year 1991 Obs = 0.447 0.494 0.053 0 0.006 -1 -1 -1  
Year 1991 Pred = 0.188046 0.622788 0.135537 0.0496433 0.00398611 -1 -1 -1  
Year 1992 Obs = 0.427 0.448 0.108 0.013 0.004 -1 -1 -1  
Year 1992 Pred = 0.378315 0.443305 0.139198 0.0287747 0.0104076 -1 -1 -1  
Year 1993 Obs = 0.215 0.748 0.028 0.009 0 -1 -1 -1  
Year 1993 Pred = 0.218104 0.740936 0.032186 0.00727387 0.00149995 -1 -1 -1  
Year 1994 Obs = 0.48951 0.437562 0.0589411 0.00699301 0.00699301 -1 -1 -1  
Year 1994 Pred = 0.234228 0.52972 0.225385 0.00868523 0.00198189 -1 -1 -1  
Year 1995 Obs = 0.388 0.483 0.117 0.008 0.004 -1 -1 -1  
Year 1995 Pred = 0.201655 0.548388 0.183552 0.0637568 0.00264847 -1 -1 -1



Year 1996 Obs = 0.056 0.633 0.291 0.02 0 -1 -1 -1  
Year 1996 Pred = 0.11382 0.566972 0.283101 0.030129 0.00597712 -1 -1 -1  
Year 1997 Obs = 0.058 0.443 0.392 0.1 0.007 -1 -1 -1  
Year 1997 Pred = 0.115619 0.416777 0.382841 0.0790787 0.00568379 -1 -1 -1  
Year 1998 Obs = 0.0840841 0.472472 0.361361 0.0730731 0.00900901 -1 -1 -1  
Year 1998 Pred = 0.131247 0.402142 0.285253 0.154552 0.0268057 -1 -1 -1  
Year 1999 Obs = 0.0559441 0.457542 0.393606 0.0819181 0.010989 -1 -1 -1  
Year 1999 Pred = 0.0960709 0.45734 0.27597 0.1167 0.0539201 -1 -1 -1  
Year 2000 Obs = 0.0690691 0.376376 0.382382 0.125125 0.047047 -1 -1 -1  
Year 2000 Pred = 0.124149 0.364669 0.318116 0.139408 0.0536581 -1 -1 -1  
Year 2001 Obs = 0.041958 0.470529 0.321678 0.127872 0.037962 -1 -1 -1  
Year 2001 Pred = 0.131725 0.439651 0.241196 0.134806 0.0526222 -1 -1 -1  
Year 2002 Obs = 0.024 0.459 0.337 0.137 0.043 -1 -1 -1  
Year 2002 Pred = 0.129094 0.426505 0.286564 0.103983 0.0538544 -1 -1 -1  
Year 2003 Obs = 0.063 0.456 0.359 0.087 0.035 -1 -1 -1  
Year 2003 Pred = 0.0830113 0.433112 0.298554 0.140585 0.0447377 -1 -1 -1  
Year 2004 Obs = 0.088 0.366 0.337 0.162 0.047 -1 -1 -1  
Year 2004 Pred = 0.133184 0.3053 0.328252 0.164058 0.0692055 -1 -1 -1  
Year 2005 Obs = 0.064 0.458 0.217 0.189 0.072 -1 -1 -1  
Year 2005 Pred = 0.0680919 0.470485 0.223736 0.165457 0.0722307 -1 -1 -1  
Year 2006 Obs = 0.112112 0.26026 0.44044 0.126126 0.0610611 -1 -1 -1  
Year 2006 Pred = 0.106435 0.285746 0.404369 0.124341 0.0791085 -1 -1 -1  
Index number 4  
Year 1982 Obs = -1 -1 0.918 0.082 -1 -1 -1 -1  
Year 1982 Pred = -1 -1 0.773547 0.226453 -1 -1 -1 -1  
Year 1983 Obs = -1 -1 0.571 0.429 -1 -1 -1 -1  
Year 1983 Pred = -1 -1 0.626753 0.373247 -1 -1 -1 -1  
Year 1984 Obs = -1 -1 0.538 0.462 -1 -1 -1 -1  
Year 1984 Pred = -1 -1 0.998454 0.00154567 -1 -1 -1 -1  
Year 1985 Obs = -1 -1 0.972 0.028 -1 -1 -1 -1  
Year 1985 Pred = -1 -1 0.867233 0.132767 -1 -1 -1 -1  
Year 1986 Obs = -1 -1 0.738 0.262 -1 -1 -1 -1  
Year 1986 Pred = -1 -1 0.576212 0.423788 -1 -1 -1 -1  
Year 1987 Obs = -1 -1 0.98 0.02 -1 -1 -1 -1  
Year 1987 Pred = -1 -1 0.880949 0.119051 -1 -1 -1 -1  
Year 1988 Obs = -1 -1 0.891 0.109 -1 -1 -1 -1  
Year 1988 Pred = -1 -1 0.791012 0.208988 -1 -1 -1 -1  
Year 1989 Obs = -1 -1 0.781 0.219 -1 -1 -1 -1  
Year 1989 Pred = -1 -1 0.542558 0.457442 -1 -1 -1 -1  
Year 1990 Obs = -1 -1 0.206 0.794 -1 -1 -1 -1  
Year 1990 Pred = -1 -1 0.896814 0.103186 -1 -1 -1 -1  
Year 1991 Obs = -1 -1 0.806 0.194 -1 -1 -1 -1  
Year 1991 Pred = -1 -1 0.658253 0.341747 -1 -1 -1 -1  
Year 1992 Obs = -1 -1 0.792 0.208 -1 -1 -1 -1  
Year 1992 Pred = -1 -1 0.773388 0.226612 -1 -1 -1 -1  
Year 1993 Obs = -1 -1 0.883 0.117 -1 -1 -1 -1  
Year 1993 Pred = -1 -1 0.757382 0.242618 -1 -1 -1 -1  
Year 1994 Obs = -1 -1 0.962 0.038 -1 -1 -1 -1  
Year 1994 Pred = -1 -1 0.948207 0.0517927 -1 -1 -1 -1  
Year 1995 Obs = -1 -1 0.961 0.039 -1 -1 -1 -1  
Year 1995 Pred = -1 -1 0.670084 0.329916 -1 -1 -1 -1  
Year 1996 Obs = -1 -1 0.857143 0.142857 -1 -1 -1 -1  
Year 1996 Pred = -1 -1 0.868921 0.131079 -1 -1 -1 -1  
Year 1997 Obs = -1 -1 0.876 0.124 -1 -1 -1 -1  
Year 1997 Pred = -1 -1 0.773523 0.226477 -1 -1 -1 -1  
Year 1998 Obs = -1 -1 0.648 0.352 -1 -1 -1 -1  
Year 1998 Pred = -1 -1 0.565615 0.434385 -1 -1 -1 -1

Year 1999 Obs	=	-1	-1	0.441	0.559	-1	-1	-1	-1
Year 1999 Pred	=	-1	-1	0.625235	0.374765	-1	-1	-1	-1
Year 2000 Obs	=	-1	-1	0.579	0.421	-1	-1	-1	-1
Year 2000 Pred	=	-1	-1	0.616838	0.383162	-1	-1	-1	-1
Year 2001 Obs	=	-1	-1	0.584	0.416	-1	-1	-1	-1
Year 2001 Pred	=	-1	-1	0.557967	0.442033	-1	-1	-1	-1
Year 2002 Obs	=	-1	-1	0.792	0.208	-1	-1	-1	-1
Year 2002 Pred	=	-1	-1	0.660354	0.339646	-1	-1	-1	-1
Year 2003 Obs	=	-1	-1	0.698	0.302	-1	-1	-1	-1
Year 2003 Pred	=	-1	-1	0.599715	0.400285	-1	-1	-1	-1
Year 2004 Obs	=	-1	-1	0.467	0.533	-1	-1	-1	-1
Year 2004 Pred	=	-1	-1	0.585332	0.414668	-1	-1	-1	-1
Year 2005 Obs	=	-1	-1	0.254	0.746	-1	-1	-1	-1
Year 2005 Pred	=	-1	-1	0.488225	0.511775	-1	-1	-1	-1
Year 2006 Obs	=	-1	-1	0.714	0.286	-1	-1	-1	-1
Year 2006 Pred	=	-1	-1	0.696448	0.303552	-1	-1	-1	-1
Index number 5									
Year 1982 Obs	=	-1	-1	0.988	0.012	-1	-1	-1	-1
Year 1982 Pred	=	-1	-1	0.872946	0.127054	-1	-1	-1	-1
Year 1983 Obs	=	-1	-1	0.802	0.198	-1	-1	-1	-1
Year 1983 Pred	=	-1	-1	0.771556	0.228444	-1	-1	-1	-1
Year 1984 Obs	=	-1	-1	0.678	0.322	-1	-1	-1	-1
Year 1984 Pred	=	-1	-1	0.999231	0.00076907	-1	-1	-1	-1
Year 1985 Obs	=	-1	-1	0.979	0.021	-1	-1	-1	-1
Year 1985 Pred	=	-1	-1	0.929269	0.0707308	-1	-1	-1	-1
Year 1986 Obs	=	-1	-1	0.76	0.24	-1	-1	-1	-1
Year 1986 Pred	=	-1	-1	0.732246	0.267754	-1	-1	-1	-1
Year 1987 Obs	=	-1	-1	0.984	0.016	-1	-1	-1	-1
Year 1987 Pred	=	-1	-1	0.937042	0.0629584	-1	-1	-1	-1
Year 1988 Obs	=	-1	-1	0.986	0.014	-1	-1	-1	-1
Year 1988 Pred	=	-1	-1	0.883895	0.116105	-1	-1	-1	-1
Year 1989 Obs	=	-1	-1	0.952	0.048	-1	-1	-1	-1
Year 1989 Pred	=	-1	-1	0.704632	0.295368	-1	-1	-1	-1
Year 1990 Obs	=	-1	-1	0	1	-1	-1	-1	-1
Year 1990 Pred	=	-1	-1	0.945891	0.0541092	-1	-1	-1	-1
Year 1991 Obs	=	-1	-1	0.98	0.02	-1	-1	-1	-1
Year 1991 Pred	=	-1	-1	0.794836	0.205164	-1	-1	-1	-1
Year 1992 Obs	=	-1	-1	1	0	-1	-1	-1	-1
Year 1992 Pred	=	-1	-1	0.872845	0.127155	-1	-1	-1	-1
Year 1993 Obs	=	-1	-1	0.941	0.059	-1	-1	-1	-1
Year 1993 Pred	=	-1	-1	0.862616	0.137384	-1	-1	-1	-1
Year 1994 Obs	=	-1	-1	1	0	-1	-1	-1	-1
Year 1994 Pred	=	-1	-1	0.973561	0.0264387	-1	-1	-1	-1
Year 1995 Obs	=	-1	-1	1	0	-1	-1	-1	-1
Year 1995 Pred	=	-1	-1	0.803351	0.196649	-1	-1	-1	-1
Year 1996 Obs	=	-1	-1	0.918	0.082	-1	-1	-1	-1
Year 1996 Pred	=	-1	-1	0.930232	0.0697677	-1	-1	-1	-1
Year 1997 Obs	=	-1	-1	0.811	0.189	-1	-1	-1	-1
Year 1997 Pred	=	-1	-1	0.872931	0.127069	-1	-1	-1	-1
Year 1998 Obs	=	-1	-1	0.692	0.308	-1	-1	-1	-1
Year 1998 Pred	=	-1	-1	0.72368	0.27632	-1	-1	-1	-1
Year 1999 Obs	=	-1	-1	0.713	0.287	-1	-1	-1	-1
Year 1999 Pred	=	-1	-1	0.770411	0.229589	-1	-1	-1	-1
Year 2000 Obs	=	-1	-1	0.823	0.177	-1	-1	-1	-1
Year 2000 Pred	=	-1	-1	0.76404	0.23596	-1	-1	-1	-1
Year 2001 Obs	=	-1	-1	0.779	0.221	-1	-1	-1	-1
Year 2001 Pred	=	-1	-1	0.717425	0.282575	-1	-1	-1	-1

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Year 2003 Obs = -1 -1 0.83 0.17 -1 -1 -1 -1  
Year 2003 Pred = -1 -1 0.750838 0.249162 -1 -1 -1 -1  
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Year 2006 Obs = -1 -1 0.87 0.13 -1 -1 -1 -1  
Year 2006 Pred = -1 -1 0.821896 0.178104 -1 -1 -1 -1  
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Year 1993 Obs = -1 -1 0.82018 0.0819181 0.0979021 -1 -1 -1  
Year 1993 Pred = -1 -1 0.737792 0.205544 0.0566642 -1 -1 -1  
Year 1994 Obs = -1 -1 0.88 0.07 0.05 -1 -1 -1  
Year 1994 Pred = -1 -1 0.941624 0.0447307 0.0136457 -1 -1 -1  
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Year 1995 Pred = -1 -1 0.688719 0.294904 0.0163773 -1 -1 -1  
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Year 1996 Pred = -1 -1 0.857641 0.112518 0.0298415 -1 -1 -1  
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Index number 7

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0 0  
Year 1985 Pred = 0.0913242 0.382788 0.472766 0.0522269 5.61752e-05 2.28725e-  
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Year 1986 Obs = 0.1 0.681 0.173 0.042 0.003 0.001 0 0  
Year 1986 Pred = 0.0969383 0.673884 0.144299 0.0765815 0.00816342 8.66146e-  
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Year 1987 Obs = 0.0539461 0.761239 0.158841 0.023976 0.001998 0 0 0  
Year 1987 Pred = 0.0281728 0.661383 0.26922 0.0262533 0.0135203 0.00142761  
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Year 1988 Obs = 0.010989 0.622378 0.338661 0.025974 0.000999001 0.000999001  
0 0  
Year 1988 Pred = 0.0809935 0.3268 0.485878 0.0926314 0.00875856 0.0044653  
0.000466052 7.11038e-06  
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Year 1990 Pred = 0.089959 0.561175 0.305406 0.0253565 0.0149604 0.00274832  
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0.002997 0  
Year 1991 Pred = 0.0602492 0.622598 0.222334 0.0832933 0.00669308 0.00401785  
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Year 1993 Pred = 0.079484 0.842513 0.0600542 0.0138817 0.00286472 0.00106061  
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Year 1995 Pred = 0.0629305 0.533975 0.293274 0.104194 0.00433149 0.00100191  
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Year 1996 Pred = 0.0323073 0.502137 0.411418 0.0447845 0.00889123  
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0.002002 0  
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Year 1998 Obs = 0 0.156156 0.613614 0.187187 0.031031 0.012012 0 0  
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Year 1999 Pred = 0.0247419 0.367503 0.363885 0.157389 0.072775 0.0126194  
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Year 2000 Pred = 0.0305915 0.280373 0.401333 0.179891 0.069292 0.0324835  
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 Year 2001 Obs = 0.005 0.609 0.257 0.099 0.025 0.004 0.001 0  
 Year 2001 Pred = 0.0338883 0.352914 0.317697 0.181615 0.0709479 0.027612  
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 Year 2002 Obs = 0.0720721 0.504505 0.315315 0.0780781 0.02002 0.00500501  
 0.004004 0.001001  
 Year 2002 Pred = 0.0328172 0.338299 0.372974 0.138427 0.0717475 0.0284472  
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 Year 2003 Obs = 0 0.430569 0.388611 0.11988 0.025974 0.026973 0.004995  
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 Year 2003 Pred = 0.0200861 0.326994 0.369865 0.17814 0.0567313 0.0294152  
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 Year 2004 Obs = 0.131 0.197 0.386 0.225 0.041 0.012 0.008 0  
 Year 2004 Pred = 0.0316905 0.226666 0.399897 0.204428 0.0862997 0.0275744  
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 Year 2005 Obs = 0.028 0.454 0.309 0.147 0.036 0.013 0.005 0.008  
 Year 2005 Pred = 0.0162823 0.351031 0.273915 0.207189 0.0905173 0.0383205  
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 Year 2006 Obs = 0.074 0.165 0.45 0.175 0.073 0.033 0.016 0.014  
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Index number 8

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Year 1990 Pred = 0.11547 0.462145 0.364968 0.0333712 0.0198694 0.00365284  
0.000337528 0.000186337  
Year 1991 Obs = 0 0.47 0.53 0 0 0 0 0  
Year 1991 Pred = 0.0788575 0.522824 0.270926 0.111779 0.00906429 0.00544534  
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Year 1992 Obs = 0.03 0.44 0.38 0.12 0.03 0 0 0  
Year 1992 Pred = 0.176128 0.413154 0.308902 0.0719293 0.0262741 0.00212934  
0.00123387 0.000249215  
Year 1993 Obs = 0.04 0.42 0.35 0.15 0 0 0.04 0  
Year 1993 Pred = 0.114467 0.778455 0.0805187 0.0204976 0.00426874 0.0015816  
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Year 1994 Obs = 0.237624 0.465347 0.237624 0 0.0594059 0 0 0  
Year 1994 Pred = 0.0964075 0.436469 0.442191 0.0191944 0.00442341  
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Year 1995 Pred = 0.0795363 0.432993 0.345089 0.135022 0.00566445 0.00131121  
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Year 1998 Pred = 0.039969 0.24516 0.414074 0.252715 0.0442656 0.00317097  
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Year 1999 Obs = 0.03 0.29 0.41 0.19 0.06 0.02 0 0  
Year 1999 Pred = 0.0291022 0.277338 0.398482 0.189812 0.0885708 0.0153698  
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Year 2000 Obs = 0.03 0.24 0.47 0.19 0.05 0.02 0 0  
Year 2000 Pred = 0.0347573 0.20438 0.424523 0.209562 0.0814599 0.0382161  
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Year 2001 Obs = 0.01 0.43 0.29 0.15 0.06 0.04 0.02 0  
Year 2001 Pred = 0.0393969 0.263231 0.343857 0.216482 0.085343 0.0332391  
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0.010101  
Year 2002 Pred = 0.0381313 0.252196 0.403471 0.164915 0.0862589 0.0342262  
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Year 2003 Obs = 0.010101 0.393939 0.383838 0.121212 0.0606061 0.020202  
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Year 2003 Pred = 0.0232083 0.242406 0.397871 0.211041 0.0678243 0.0351931  
0.0139463 0.00851017  
Year 2004 Obs = 0.049505 0.247525 0.405941 0.207921 0.0594059 0.019802  
0.00990099 0  
Year 2004 Pred = 0.0351667 0.161378 0.413145 0.232595 0.0990894 0.0316845  
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Year 2005 Obs = 0.02 0.22 0.39 0.21 0.07 0.06 0.01 0.02  
Year 2005 Pred = 0.0188051 0.260114 0.29453 0.245351 0.10817 0.0458281  
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Year 2006 Obs = 0 0.178218 0.356436 0.217822 0.168317 0.049505 0.019802  
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Year 2006 Pred = 0.0264878 0.142357 0.47968 0.166148 0.106755 0.0468328  
0.0198903 0.0118497  
Index number 10  
Year 1988 Obs = 0.04 0.72 0.24 0 0 0 0 0  
Year 1988 Pred = 0.478662 0.221002 0.242844 0.0498092 0.00488706 0.00252723  
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Year 1989 Obs = 0.59 0.3 0.11 0 0 0 0 0  
Year 1989 Pred = 0.412954 0.474778 0.0624256 0.0408599 0.00782641  
0.000741974 0.000375094 3.91723e-05  
Year 1990 Obs = 0.45 0.5 0.04 0.01 0 0 0 0  
Year 1990 Pred = 0.488847 0.348949 0.140355 0.0125369 0.00767554 0.00143025  
0.000132851 7.34852e-05  
Year 1991 Obs = 0.25 0.68 0.07 0 0 0 0 0  
Year 1991 Pred = 0.379 0.448158 0.118281 0.0476728 0.00397512 0.00242046  
0.000430988 6.25684e-05  
Year 1992 Obs = 0.232323 0.636364 0.121212 0.010101 0 0 0 0  
Year 1992 Pred = 0.613706 0.256759 0.0977738 0.0222409 0.00835377  
0.000686208 0.000399716 8.08919e-05  
Year 1993 Obs = 0.30303 0.676768 0.020202 0 0 0 0 0  
Year 1993 Pred = 0.435244 0.527916 0.0278111 0.00691623 0.00148106  
0.000556192 4.39514e-05 3.09501e-05  
Year 1994 Obs = 0.584158 0.376238 0.029703 0 0.00990099 0 0 0  
Year 1994 Pred = 0.444993 0.359315 0.185405 0.00786194 0.00186303  
0.000396055 0.000146427 1.96601e-05  
Year 1995 Obs = 0.59 0.35 0.03 0.01 0.02 0 0 0  
Year 1995 Pred = 0.396167 0.384657 0.156139 0.0596804 0.00257449 0.000604034  
0.000125456 5.25506e-05  
Year 1996 Obs = 0.168317 0.524752 0.277228 0.019802 0.00990099 0 0 0  
Year 1996 Pred = 0.249441 0.443635 0.26864 0.0314606 0.00648136 0.00026301  
6.09251e-05 1.79867e-05  
Year 1997 Obs = 0.10101 0.505051 0.323232 0.0606061 0.010101 0 0 0  
Year 1997 Pred = 0.245338 0.315759 0.351751 0.0799521 0.00596759 0.00117176  
4.7012e-05 1.41058e-05  
Year 1998 Obs = 0.0707071 0.616162 0.282828 0.030303 0 0 0 0  
Year 1998 Pred = 0.269831 0.295189 0.253931 0.151396 0.0272682 0.00197987  
0.000385 2.0066e-05  
Year 1999 Obs = 0.09 0.53 0.3 0.06 0.01 0.01 0 0  
Year 1999 Pred = 0.206057 0.350228 0.256294 0.119261 0.0572233 0.0100648  
0.000723929 0.000148126  
Year 2000 Obs = 0.128713 0.524752 0.247525 0.0594059 0.019802 0.00990099  
0.00990099 0  
Year 2000 Pred = 0.248273 0.260376 0.275457 0.132834 0.0530944 0.0252469  
0.00433807 0.000379096  
Year 2001 Obs = 0.11 0.58 0.21 0.07 0.02 0.01 0 0

Year 2001 Pred = 0.263757 0.314311 0.209117 0.128611 0.0521352 0.0205811  
 0.0096752 0.00181256  
 Year 2002 Obs = 0.09 0.54 0.25 0.08 0.03 0.01 0 0  
 Year 2002 Pred = 0.25875 0.305221 0.248702 0.0993053 0.0534099 0.0214799  
 0.00842335 0.00470908  
 Year 2003 Obs = 0.0594059 0.564356 0.257426 0.0594059 0.019802 0.019802  
 0.00990099 0.00990099  
 Year 2003 Pred = 0.174703 0.325446 0.272062 0.140973 0.0465868 0.0245014  
 0.00976037 0.00596749  
 Year 2004 Obs = 0.0808081 0.59596 0.232323 0.0505051 0.020202 0.010101  
 0.010101 0  
 Year 2004 Pred = 0.257448 0.210709 0.274745 0.151103 0.0661921 0.0214527  
 0.0111761 0.00717493  
 Year 2005 Obs = 0.277228 0.534653 0.108911 0.049505 0.019802 0.00990099 0 0  
 Year 2005 Pred = 0.144251 0.355865 0.20523 0.167011 0.0757133 0.0325126  
 0.0104681 0.00894871  
 Year 2006 Obs = 0.0792079 0.534653 0.29703 0.049505 0.019802 0.00990099  
 0.00990099 0  
 Year 2006 Pred = 0.208205 0.199573 0.342503 0.115892 0.0765691 0.0340464  
 0.0145357 0.00867656  
 Index number 11  
 N/A  
 Index number 12  
 N/A  
 Index number 13  
 N/A

Index Selectivity at Age

0.106403 0.244817 0.469495 0.708798 0.872376 0.953313 0.987 1  
 0.00292969 0.278651 0.980689 0.99985 0.999999 1 1 1  
 0.224921 0.970976 0.999741 0.999998 1 1 1 1  
 0 0 0.70531 1 0 0 0 0  
 0 0 0.999975 0.704889 0 0 0 0  
 0 0 0.606629 0.748008 1 0 0 0  
 0.042917 0.57808 0.97667 0.999219 0.999974 0.999999 1 1  
 0 0 1 0.598093 0 0 0 0  
 0.0414441 0.35816 0.87808 0.989357 0.999168 0.999936 0.999995 1  
 0.444903 0.685741 0.856259 0.942475 0.978728 0.992777 0.998047 1  
 1 0 0 0 0 0 0 0  
 1 0 0 0 0 0 0 0  
 1 0 0 0 0 0 0 0

Deviations section: only applicable if associated lambda > 0

Nyear1 observed, expected, standardized residual

2 286.252 3503.99 -3.2518  
 3 164.732 752.269 -1.97172  
 4 34.0134 117.878 -1.61357  
 5 6276.04 18.4496 7.56799  
 6 1.15039 2.87895 -1.1909  
 7 1.51314 0.445747 1.58669  
 8 0.0943591 0.0802721 0.209906

Fleet Obs, Initial, and Standardized Residual for Fmult

1 1.06156 0.5 0.977426  
 2 0.13451 0.2 -0.514978  
 3 3.05902e-07 0.05 -15.5843  
 4 3.05902e-07 0.05 -15.5843



5 0.489352 0.2 1.16161  
6 0.0794867 0.05 0.601818

Standardized Residuals for Fmult\_devs by fleet and year  
N/A

Index Obs, Initial, and Standardized Residual for q\_year1  
N/A

Standardized Residuals for catchability deviations by index and year  
index 1 q\_devs standardized residuals

2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0

index 2 q\_devs standardized residuals

2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
23 0  
24 0  
25 0

index 3 q\_devs standardized residuals

2 0  
3 0  
4 0  
5 0  
6 0  
7 0

8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
23 0  
24 0  
25 0

index 4 q\_devs standardized residuals

2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
23 0  
24 0  
25 0

index 5 q\_devs standardized residuals

2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0

15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
23 0  
24 0  
25 0

index 6 q\_devs standardized residuals

2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
23 0

index 7 q\_devs standardized residuals

2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
23 0

index 8 q\_devs standardized residuals

2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
23 0  
24 0  
25 0

index 9 q\_devs standardized residuals

2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0

index 10 q\_devs standardized residuals

2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0

```
16 0
17 0
18 0
19 0
  index 11 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
20 0
21 0
  index 12 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
20 0
21 0
22 0
23 0
24 0
25 0
  index 13 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
```











0.00296665 0.0526701 0.442878 0.725559 0.750759 0.752133 0.752205 0.752209  
0.00155393 0.0275886 0.231979 0.380047 0.393247 0.393967 0.394005 0.394007  
0.00138289 0.0245518 0.206445 0.338215 0.349961 0.350602 0.350636 0.350637  
0.0011688 0.020751 0.174485 0.285855 0.295784 0.296325 0.296353 0.296355  
0.00101249 0.0179758 0.15115 0.247627 0.256227 0.256696 0.256721 0.256722  
0.00100652 0.0178699 0.15026 0.246167 0.254717 0.255183 0.255208 0.255209  
0.00119104 0.0211458 0.177805 0.291294 0.301411 0.301963 0.301992 0.301993  
0.000995445 0.0176732 0.148605 0.243457 0.251913 0.252374 0.252399 0.2524  
0.00122122 0.0216816 0.18231 0.298675 0.309049 0.309614 0.309644 0.309646  
0.00144521 0.0256583 0.215749 0.353457 0.365733 0.366402 0.366438 0.366439  
0.00107134 0.0190207 0.159936 0.26202 0.27112 0.271617 0.271643 0.271644  
fleet 2 directed F at age  
0.13451 0.13451 0.13451 0.13451 0.13451 0.13451 0.13451 0.13451  
0.101086 0.101086 0.101086 0.101086 0.101086 0.101086 0.101086 0.101086  
0.231708 0.231708 0.231708 0.231708 0.231708 0.231708 0.231708 0.231708  
0.159363 0.159363 0.159363 0.159363 0.159363 0.159363 0.159363 0.159363  
0.103539 0.103539 0.103539 0.103539 0.103539 0.103539 0.103539 0.103539  
0.12732 0.12732 0.12732 0.12732 0.12732 0.12732 0.12732 0.12732  
0.181179 0.181179 0.181179 0.181179 0.181179 0.181179 0.181179 0.181179  
0.180533 0.180533 0.180533 0.180533 0.180533 0.180533 0.180533 0.180533  
0.0927925 0.0927925 0.0927925 0.0927925 0.0927925 0.0927925 0.0927925  
0.0927925  
0.165015 0.165015 0.165015 0.165015 0.165015 0.165015 0.165015 0.165015  
0.0877475 0.0877475 0.0877475 0.0877475 0.0877475 0.0877475 0.0877475  
0.0877475  
0.0778725 0.0778725 0.0778725 0.0778725 0.0778725 0.0778725 0.0778725  
0.0778725  
0.0689036 0.0689036 0.0689036 0.0689036 0.0689036 0.0689036 0.0689036  
0.0689036  
0.00383534 0.0458592 0.276473 0.447964 0.470166 0.471946 0.472082 0.472093  
0.00275944 0.0329948 0.198917 0.322301 0.338274 0.339555 0.339653 0.339661  
0.000633141 0.00757049 0.0456404 0.0739503 0.0776154 0.0779093 0.0779318  
0.0779335  
0.00100717 0.0120428 0.0726025 0.117637 0.123467 0.123934 0.12397 0.123973  
0.000849888 0.0101621 0.0612648 0.0992662 0.104186 0.10458 0.104611 0.104613  
0.000880068 0.010523 0.0634403 0.102791 0.107886 0.108294 0.108325 0.108328  
0.000699909 0.00836883 0.0504534 0.0817487 0.0858003 0.0861252 0.08615  
0.0861519  
0.000947829 0.0113332 0.0683249 0.110706 0.116192 0.116632 0.116666 0.116668  
0.000678489 0.00811272 0.0489094 0.079247 0.0831745 0.0834895 0.0835136  
0.0835154  
0.000913388 0.0109214 0.0658422 0.106683 0.11197 0.112394 0.112427 0.112429  
0.000910329 0.0108848 0.0656217 0.106326 0.111595 0.112018 0.11205 0.112053  
0.000874555 0.0104571 0.063043 0.102147 0.10721 0.107616 0.107647 0.107649  
fleet 3 directed F at age  
7.16653e-11 3.05902e-07 1.27858e-08 2.07233e-08 1.68232e-10 3.05902e-08  
1.52951e-08 3.05902e-09  
2.59287e-17 1.10676e-13 4.62591e-15 7.49773e-15 6.08668e-17 1.10676e-14  
5.5338e-15 1.10676e-15  
1.94255e-22 8.29175e-19 3.46569e-20 5.61723e-20 4.56009e-22 8.29175e-20  
4.14588e-20 8.29175e-21  
4.55431e-19 1.944e-15 8.12531e-17 1.31696e-16 1.06911e-18 1.944e-16  
9.71999e-17 1.944e-17  
9.11746e-25 3.89177e-21 1.62664e-22 2.63647e-22 2.1403e-24 3.89177e-22  
1.94589e-22 3.89177e-23  
9.70222e-19 4.14138e-15 1.73097e-16 2.80557e-16 2.27757e-18 4.14138e-16  
2.07069e-16 4.14138e-17

3.06863e-12 1.30984e-08 5.47473e-10 8.87349e-10 7.20353e-12 1.30984e-09  
 6.54921e-10 1.30984e-10  
 1.00314e-05 0.0428189 0.0017897 0.00290076 2.35485e-05 0.00428189 0.00214095  
 0.000428189  
 7.37816e-05 0.314935 0.0131633 0.0213352 0.0001732 0.0314935 0.0157468  
 0.00314935  
 5.62146e-05 0.239951 0.0100292 0.0162555 0.000131962 0.0239951 0.0119976  
 0.00239951  
 6.75682e-05 0.288414 0.0120548 0.0195385 0.000158614 0.0288414 0.0144207  
 0.00288414  
 2.32853e-05 0.099393 0.00415432 0.00673336 5.46616e-05 0.0099393 0.00496965  
 0.00099393  
 1.31079e-05 0.0559511 0.00233858 0.00379039 3.07705e-05 0.00559511  
 0.00279755 0.000559511  
 2.77407e-06 0.0118411 0.000494919 0.00080217 6.51204e-06 0.00118411  
 0.000592053 0.000118411  
 5.861e-06 0.0250176 0.00104566 0.00169481 1.37585e-05 0.00250176 0.00125088  
 0.000250176  
 5.88998e-06 0.0251413 0.00105083 0.00170319 1.38266e-05 0.00251413  
 0.00125706 0.000251413  
 5.90762e-06 0.0252166 0.00105397 0.00170829 1.3868e-05 0.00252166 0.00126083  
 0.000252166  
 3.21578e-05 0.137265 0.00573724 0.00929898 7.54894e-05 0.0137265 0.00686324  
 0.00137265  
 1.56122e-05 0.0666405 0.00278536 0.00451455 3.66492e-05 0.00666405  
 0.00333203 0.000666405  
 4.7169e-06 0.020134 0.000841539 0.00136398 1.10728e-05 0.0020134 0.0010067  
 0.00020134  
 6.4483e-06 0.0275245 0.00115044 0.00186464 1.51372e-05 0.00275245 0.00137622  
 0.000275245  
 8.49783e-06 0.0362729 0.00151609 0.0024573 1.99484e-05 0.00362729 0.00181364  
 0.000362729  
 4.55688e-06 0.019451 0.00081299 0.0013177 1.06972e-05 0.0019451 0.000972549  
 0.00019451  
 3.38929e-06 0.0144671 0.000604681 0.000980073 7.95627e-06 0.00144671  
 0.000723357 0.000144671  
 8.41872e-06 0.0359352 0.00150198 0.00243442 1.97627e-05 0.00359352  
 0.00179676 0.000359352  
 fleet 4 directed F at age  
 3.58631e-11 2.41655e-09 3.05902e-07 2.7123e-08 1.63405e-10 3.05902e-08  
 1.52951e-08 3.05902e-09  
 6.64144e-14 4.47517e-12 5.66497e-10 5.02288e-11 3.02609e-13 5.66497e-11  
 2.83248e-11 5.66497e-12  
 4.85907e-16 3.27416e-14 4.14465e-12 3.67488e-13 2.21397e-15 4.14465e-13  
 2.07233e-13 4.14465e-14  
 5.14379e-20 3.46602e-18 4.38751e-16 3.89021e-17 2.3437e-19 4.38751e-17  
 2.19376e-17 4.38751e-18  
 5.22466e-21 3.52051e-19 4.45649e-17 3.95137e-18 2.38054e-20 4.45649e-18  
 2.22824e-18 4.45649e-19  
 1.59888e-27 1.07737e-25 1.3638e-23 1.20922e-24 7.28509e-27 1.3638e-24  
 6.81901e-25 1.3638e-25  
 4.77459e-21 3.21724e-19 4.07259e-17 3.61099e-18 2.17548e-20 4.07259e-18  
 2.0363e-18 4.07259e-19  
 2.75289e-27 1.85497e-25 2.34814e-23 2.08199e-24 1.25432e-26 2.34814e-24  
 1.17407e-24 2.34814e-25  
 1.90965e-25 1.28677e-23 1.62888e-21 1.44426e-22 8.70108e-25 1.62888e-22  
 8.1444e-23 1.62888e-23

2.54296e-23 1.71351e-21 2.16907e-19 1.92322e-20 1.15867e-22 2.16907e-20  
 1.08454e-20 2.16907e-21  
 2.1989e-17 1.48168e-15 1.8756e-13 1.66301e-14 1.0019e-16 1.8756e-14  
 9.37802e-15 1.8756e-15  
 2.84891e-12 1.91967e-10 2.43004e-08 2.15461e-09 1.29807e-11 2.43004e-09  
 1.21502e-09 2.43004e-10  
 9.31313e-06 0.000627542 0.0794384 0.00704345 4.2434e-05 0.00794384  
 0.00397192 0.000794384  
 6.2757e-06 0.000422873 0.05353 0.00474627 2.85944e-05 0.005353 0.0026765  
 0.0005353  
 2.32333e-06 0.000156552 0.0198173 0.00175711 1.05859e-05 0.00198173  
 0.000990866 0.000198173  
 1.08176e-06 7.28915e-05 0.00922708 0.000818124 4.92888e-06 0.000922708  
 0.000461354 9.22708e-05  
 2.13161e-06 0.000143633 0.018182 0.00161212 9.71238e-06 0.0018182 0.0009091  
 0.00018182  
 6.13773e-06 0.000413576 0.0523532 0.00464192 2.79658e-05 0.00523532  
 0.00261766 0.000523532  
 1.87624e-06 0.000126426 0.0160038 0.00141899 8.54885e-06 0.00160038  
 0.000800191 0.000160038  
 3.76522e-06 0.00025371 0.0321163 0.00284761 1.71557e-05 0.00321163  
 0.00160581 0.000321163  
 1.79375e-06 0.000120868 0.0153002 0.0013566 8.173e-06 0.00153002 0.000765011  
 0.000153002  
 9.09999e-07 6.1318e-05 0.00776204 0.000688225 4.14629e-06 0.000776204  
 0.000388102 7.76204e-05  
 8.15663e-07 5.49615e-05 0.00695738 0.00061688 3.71646e-06 0.000695738  
 0.000347869 6.95738e-05  
 1.32501e-06 8.92823e-05 0.0113019 0.00100209 6.03722e-06 0.00113019  
 0.000565097 0.000113019  
 8.81826e-07 5.94197e-05 0.00752173 0.000666918 4.01792e-06 0.000752173  
 0.000376086 7.52173e-05  
 fleet 5 directed F at age  
 0.331986 0.355263 0.378585 0.401756 0.424589 0.446903 0.468538 0.489352  
 0.36323 0.388698 0.414214 0.439567 0.464548 0.488963 0.512634 0.535406  
 0.324539 0.347294 0.370092 0.392744 0.415065 0.436879 0.458028 0.478375  
 0.220393 0.235846 0.251328 0.266711 0.281868 0.296682 0.311045 0.324862  
 0.298771 0.319719 0.340707 0.361561 0.382109 0.402191 0.421661 0.440393  
 0.279499 0.299096 0.318731 0.338239 0.357462 0.376249 0.394463 0.411986  
 0.341913 0.365886 0.389905 0.41377 0.437285 0.460267 0.482549 0.503985  
 0.12698 0.135884 0.144804 0.153667 0.1624 0.170935 0.17921 0.187171  
 0.170002 0.181922 0.193864 0.20573 0.217422 0.228849 0.239927 0.250585  
 0.351334 0.375968 0.400649 0.425171 0.449334 0.47295 0.495845 0.517872  
 0.235756 0.252286 0.268847 0.285302 0.301517 0.317363 0.332727 0.347507  
 0.221987 0.237551 0.253145 0.268639 0.283907 0.298828 0.313294 0.327211  
 0.170745 0.182717 0.194711 0.206629 0.218372 0.229849 0.240976 0.251681  
 0.00323518 0.0924137 0.300548 0.318573 0.319054 0.319066 0.319066 0.319066  
 0.00451301 0.128915 0.419258 0.444403 0.445074 0.44509 0.445091 0.445091  
 0.0040786 0.116506 0.378901 0.401626 0.402232 0.402247 0.402248 0.402248  
 0.00372775 0.106484 0.346307 0.367077 0.367631 0.367645 0.367645 0.367645  
 0.00237007 0.0677014 0.220179 0.233384 0.233736 0.233745 0.233745 0.233745  
 0.00407121 0.116295 0.378214 0.400898 0.401503 0.401518 0.401518 0.401518  
 0.00275186 0.0786074 0.255647 0.270979 0.271388 0.271399 0.271399 0.271399  
 0.00175019 0.0499944 0.162592 0.172343 0.172603 0.17261 0.17261 0.17261  
 0.00212256 0.0606314 0.197185 0.209012 0.209327 0.209335 0.209335 0.209335  
 0.0019712 0.0563076 0.183124 0.194107 0.194399 0.194407 0.194407 0.194407  
 0.00230316 0.0657904 0.213963 0.226796 0.227138 0.227147 0.227147 0.227147

0.00240851 0.0687997 0.22375 0.23717 0.237528 0.237537 0.237537 0.237537  
 fleet 6 directed F at age  
 0.00542438 0.0752366 0.0794867 0.0567772 0.0369566 0.0224546 0.0130109  
 0.00731811  
 0.00257076 0.0356566 0.0376709 0.0269082 0.0175147 0.0106418 0.00616624  
 0.00346825  
 0.00177919 0.0246775 0.0260715 0.0186228 0.0121217 0.00736507 0.00426757  
 0.00240033  
 0.000610965 0.00847413 0.00895283 0.00639499 0.00416253 0.00252913  
 0.00146546 0.000824261  
 0.00322376 0.0447138 0.0472397 0.0337432 0.0219636 0.013345 0.00773253  
 0.00434922  
 0.00269711 0.0374091 0.0395224 0.0282308 0.0183755 0.0111649 0.0064693  
 0.00363871  
 0.00346788 0.0480998 0.0508169 0.0362984 0.0236268 0.0143555 0.00831807  
 0.00467856  
 0.000493531 0.00684531 0.007232 0.00516581 0.00336245 0.002043 0.00118378  
 0.000665829  
 0.00234293 0.0324966 0.0343323 0.0245235 0.0159625 0.00969872 0.00561976  
 0.00316088  
 0.00452966 0.0628268 0.0663759 0.0474122 0.0308608 0.0187509 0.0108649  
 0.00611103  
 0.00551525 0.0764969 0.0808183 0.0577283 0.0375757 0.0228308 0.0132289  
 0.0074407  
 0.00678378 0.0940915 0.0994068 0.0710061 0.0462182 0.0280819 0.0162716  
 0.00915209  
 0.00397611 0.055149 0.0582644 0.0416181 0.0270894 0.0164594 0.00953712  
 0.00536423  
 0.00355688 0.0426897 0.0590028 0.0286285 0.00906551 0.00239937 0.000601658  
 0.000148763  
 0.00252274 0.030278 0.0418482 0.020305 0.00642979 0.00170177 0.000426731  
 0.000105511  
 0.00197396 0.0236915 0.0327447 0.0158879 0.00503108 0.00133158 0.000333902  
 8.25586e-05  
 0.00265315 0.0318432 0.0440114 0.0213546 0.00676215 0.00178974 0.00044879  
 0.000110965  
 0.00288036 0.0345701 0.0477804 0.0231833 0.00734125 0.00194301 0.000487223  
 0.000120468  
 0.00353926 0.0424783 0.0587105 0.0284867 0.0090206 0.00238749 0.000598678  
 0.000148026  
 0.00443548 0.0532347 0.0735773 0.0357001 0.0113048 0.00299205 0.000750277  
 0.000185509  
 0.00250416 0.030055 0.0415398 0.0201554 0.00638241 0.00168924 0.000423587  
 0.000104734  
 0.00247483 0.029703 0.0410535 0.0199194 0.00630768 0.00166946 0.000418627  
 0.000103507  
 0.00319951 0.0384006 0.0530746 0.0257521 0.00815468 0.0021583 0.000541208  
 0.000133816  
 0.00364454 0.0437418 0.0604569 0.029334 0.00928893 0.00245851 0.000616486  
 0.000152429  
 0.00309791 0.0371812 0.0513892 0.0249343 0.00789572 0.00208976 0.000524022  
 0.000129567  
 Discard F by age and year for each fleet  
 fleet 1 Discard F at age  
 0 0 0 0 0 0 0  
 0 0 0 0 0 0 0  
 0 0 0 0 0 0 0









0.00952051 0.254039 0.670305 0.785736 0.774681 0.77716 0.771296 0.767543  
0.00890225 0.178469 0.562895 0.638807 0.623239 0.620924 0.61612 0.613468  
0.00640145 0.140174 0.466712 0.59772 0.596613 0.597177 0.593833 0.591805  
0.00628074 0.152454 0.445032 0.554781 0.550746 0.551272 0.547868 0.545794  
0.00731068 0.146817 0.492121 0.627151 0.623587 0.621214 0.618339 0.61688  
0.00830795 0.160632 0.567697 0.717894 0.713769 0.710602 0.70754 0.706049  
0.00746162 0.171453 0.507142 0.629373 0.623778 0.623205 0.619523 0.617394

Average F for ages 3 to 5

Freport unweighted in .std and MCMC files

year	unweighted	Nweighted	Bweighted
1982	1.65522	1.6575	1.65758
1983	1.67166	1.6623	1.66505
1984	1.49366	1.47791	1.47794
1985	1.64075	1.62869	1.62948
1986	1.4651	1.46007	1.46141
1987	1.36289	1.35542	1.35686
1988	1.98081	1.97226	1.97341
1989	1.42041	1.41714	1.41826
1990	0.925277	0.924658	0.924668
1991	1.47526	1.4732	1.4747
1992	2.494	2.49943	2.4984
1993	1.03253	1.04182	1.03989
1994	0.842362	0.893591	0.890187
1995	1.77962	1.54293	1.58347
1996	1.39345	1.16858	1.1937
1997	0.81724	0.731217	0.738249
1998	0.794683	0.750405	0.765123
1999	0.619526	0.595893	0.605792
2000	0.743574	0.712734	0.726137
2001	0.608314	0.594174	0.600351
2002	0.553681	0.5131	0.526045
2003	0.516853	0.486686	0.498406
2004	0.580953	0.547767	0.562355
2005	0.666454	0.644411	0.659251
2006	0.586764	0.54732	0.562267

Population Numbers at the Start of the Year

79921.3 286.252 164.732 34.0134 6276.04 1.15039 1.51314 0.0943591  
123682 40613.2 61.4552 25.813 5.3236 979.338 0.178115 0.245655  
44589 63155.3 8794.85 9.60277 3.97214 0.806531 145.791 0.0611728  
66874.1 20810 15212.5 1642.61 1.76546 0.71881 0.143484 25.483  
72109.2 37215.3 4716.73 2446.74 260.62 0.276513 0.111109 3.85796  
22478.1 39176.3 9438.83 899.666 462.974 48.8842 0.0512741 0.715114  
40624.6 12169.2 10709 1995.56 188.544 96.1211 10.0323 0.15306  
26168.4 19519.6 2055.41 1222.27 225.446 21.0707 10.5957 1.10438  
33824.5 15664.9 5045.99 409.491 241.419 44.3491 4.09768 2.26216  
27610.9 21182.6 4477.3 1639.49 131.642 79.023 13.9966 2.02798  
49273 13374.5 4078.79 842.941 304.884 24.6898 14.3059 2.88947  
36531.7 28748 1212.87 274.032 56.5084 20.9207 1.64446 1.15575  
41893.3 21946.8 9069.25 349.395 79.7287 16.7094 6.14507 0.823459  
42575 26819.8 8718.64 3027.63 125.768 29.0905 6.0101 2.51258  
29748.6 34326.4 16646.7 1771.17 351.372 14.0567 3.23898 0.954367  
28798.2 24047 21453.4 4430.23 318.422 61.6384 2.45994 0.736653  
32946.7 23384.3 16110 8726.29 1513.49 108.336 20.9553 1.09005  
24247.8 26738.7 15670.5 6624.92 3060.99 530.77 37.9748 7.75499  
28964.3 19707.9 16697.3 7315.41 2815.69 1319.94 225.602 19.6765

30381.5 23489.3 12515.6 6993.25 2729.85 1062.4 496.797 92.8886  
32213.9 24653.8 16088 5836.23 3022.66 1198.43 467.481 260.835  
21683.1 26206.3 17544.8 8259.5 2628.37 1362.78 540.01 329.517  
33222.8 17641.4 18422 9204.81 3882.9 1240.63 642.913 411.936  
16870.6 27002.4 12471.4 9220.44 4025.2 1704.03 545.749 465.626  
22026.7 13698.2 18827 5787.71 3682.27 1614.15 685.5 408.386

q by index

index 1 q over time

1992 0.000899486  
1993 0.000899486  
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2004 0.000899486  
2005 0.000899486  
2006 0.000899486

index 2 q over time

1982 6.95525e-05  
1983 6.95525e-05  
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1986 6.95525e-05  
1987 6.95525e-05  
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2004 6.95525e-05  
2005 6.95525e-05  
2006 6.95525e-05

index 3 q over time

1982 4.32841e-05  
1983 4.32841e-05  
1984 4.32841e-05  
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2006 4.32841e-05

index 4 q over time

1982 0.000134194  
1983 0.000134194  
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2005 0.000134194  
2006 0.000134194

index 5 q over time

1982 9.28585e-05  
1983 9.28585e-05  
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2006 9.28585e-05

index 6 q over time

1984 4.38692e-05  
1985 4.38692e-05  
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2006 4.38692e-05

index 7 q over time

1984 4.66135e-05  
1985 4.66135e-05  
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2002 4.66135e-05  
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2005 4.66135e-05  
2006 4.66135e-05

index 8 q over time

1982 6.77292e-05  
1983 6.77292e-05  
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2006 6.77292e-05

index 9 q over time

1990 2.69239e-05  
1991 2.69239e-05  
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2002 2.69239e-05  
2003 2.69239e-05  
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2005 2.69239e-05  
2006 2.69239e-05

index 10 q over time

1988 0.000155852  
1989 0.000155852  
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2002 0.000155852  
2003 0.000155852  
2004 0.000155852  
2005 0.000155852  
2006 0.000155852

index 11 q over time

1986 5.30611e-06  
1987 5.30611e-06  
1988 5.30611e-06  
1989 5.30611e-06  
1990 5.30611e-06  
1991 5.30611e-06  
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2002 5.30611e-06  
2003 5.30611e-06  
2004 5.30611e-06  
2005 5.30611e-06  
2006 5.30611e-06

index 12 q over time

1982 0.000224697  
1983 0.000224697  
1984 0.000224697  
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2004 0.000224697  
 2005 0.000224697  
 2006 0.000224697  
 index 13 q over time  
 1982 2.65319e-05  
 1983 2.65319e-05  
 1984 2.65319e-05  
 1985 2.65319e-05  
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 1987 2.65319e-05  
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 2003 2.65319e-05  
 2004 2.65319e-05  
 2005 2.65319e-05  
 2006 2.65319e-05

Proportions of catch at age by fleet  
 fleet 1

Year 1 Obs = 0.0999237 0.477013 0.390403 0.0160876 0.00422994 0.0067263  
 0.00395257 0.00166424  
 Year 1 Pred = 0.0827446 0.0320251 0.0225304 0.00465316 0.857672 0.000156777  
 0.000205328 1.27364e-05  
 Year 2 Obs = 0.10236 0.634204 0.227746 0.0289916 0.00156994 0.00324454  
 0.000680308 0.00120362  
 Year 2 Pred = 0.0265622 0.943565 0.00173806 0.000726579 0.000149028  
 0.0272473 4.92241e-06 6.7417e-06  
 Year 3 Obs = 0.0664268 0.506889 0.31883 0.0766062 0.0272241 0.00340893  
 0.000142039 0.000473462  
 Year 3 Pred = 0.00509288 0.845532 0.14676 0.000159426 6.55665e-05 1.32308e-  
 05 0.00237605 9.9035e-07  
 Year 4 Obs = 0.0447546 0.343172 0.536416 0.0509351 0.0140125 0.00900421  
 0.00133198 0.000372955  
 Year 4 Pred = 0.0150919 0.497365 0.43949 0.0472574 5.05597e-05 2.04899e-05  
 4.07094e-06 0.000719667  
 Year 5 Obs = 0.0249296 0.431275 0.39042 0.135673 0.00967781 0.00569644  
 0.00177631 0.000551268  
 Year 5 Pred = 0.0137248 0.791856 0.123567 0.0639529 0.00679021 7.17411e-06  
 2.86816e-06 9.9034e-05  
 Year 6 Obs = 0.0183903 0.493436 0.413006 0.0517919 0.0186673 0.00127403  
 0.00132942 0.00210491  
 Year 6 Pred = 0.0036891 0.741361 0.221885 0.0210933 0.0108168 0.00113718  
 1.18678e-06 1.64618e-05

Year 7 Obs = 0.0137816 0.502282 0.406308 0.0578374 0.0147757 0.00356965  
0.000813339 0.000632597  
Year 7 Pred = 0.0142398 0.432587 0.455982 0.084738 0.00797749 0.00404863  
0.000420311 6.37521e-06  
Year 8 Obs = 0.0113879 0.295492 0.572835 0.0997628 0.0180308 0.00189798  
0.000355872 0.000237248  
Year 8 Pred = 0.0100543 0.808319 0.105708 0.0627009 0.0115477 0.00107471  
0.000539383 5.61008e-05  
Year 9 Obs = 0 0.651696 0.210154 0.112033 0.0197706 0.00439346 0.00146449  
0.000488162  
Year 9 Pred = 0.012688 0.645397 0.300237 0.0242755 0.0144175 0.00260945  
0.000241961 0.000133817  
Year 10 Obs = 0 0.519579 0.450533 0.0196485 0.00844057 0.00152207  
0.00013837 0.00013837  
Year 10 Pred = 0.0086662 0.704666 0.20258 0.0738946 0.00595189 0.00352696  
0.000624011 9.01616e-05  
Year 11 Obs = 0.0115983 0.586021 0.36372 0.034388 0.00193306 0.00223827 0  
0.00010174  
Year 11 Pred = 0.031705 0.648632 0.24738 0.0511248 0.0186207 0.00149457  
0.000868227 0.000175496  
Year 12 Obs = 0.0213669 0.609594 0.331116 0.0246215 0.00410358 0.00608462  
0.00268855 0.000424508  
Year 12 Pred = 0.0100724 0.923292 0.0515034 0.0116904 0.00242637 0.000895901  
7.04873e-05 4.94834e-05  
Year 13 Obs = 0.0151246 0.470005 0.469243 0.0345704 0.00813421 0.00152517  
0.000762583 0.000635486  
Year 13 Pred = 0.00976979 0.637116 0.33579 0.0133544 0.0030646 0.000638454  
0.00023505 3.14828e-05  
Year 14 Obs = 0.00640312 0.357183 0.595768 0.0335468 0.00556793 0.00111359  
0.000278396 0.000139198  
Year 14 Pred = 0.0275874 0.272758 0.468688 0.218893 0.00929184 0.00215045  
0.000445033 0.000186239  
Year 15 Obs = 0 0.251933 0.573098 0.143499 0.0280525 0.00269736 0.000539471  
0.000179824  
Year 15 Pred = 0.0125096 0.226992 0.643153 0.0966573 0.0196654 0.000787474  
0.000181689 5.35757e-05  
Year 16 Obs = 0 0.086758 0.557534 0.277169 0.059589 0.0157534 0.00228311  
0.000913242  
Year 16 Pred = 0.00809008 0.109471 0.657279 0.206685 0.0153454 0.002975  
0.000118871 3.56212e-05  
Year 17 Obs = 0 0.0439265 0.385253 0.45316 0.0979381 0.0161363 0.00336172  
0.000224115  
Year 17 Pred = 0.00838592 0.0964902 0.449404 0.373008 0.0669349 0.00479904  
0.000929692 4.84021e-05  
Year 18 Obs = 0 0.0307962 0.39309 0.381072 0.14647 0.0400601 0.00650976  
0.002003  
Year 18 Pred = 0.00584186 0.100998 0.436765 0.290452 0.139729 0.0241233  
0.0017342 0.000355364  
Year 19 Obs = 0 0.0548229 0.500129 0.280062 0.116111 0.0307732 0.0121541  
0.00594776  
Year 19 Pred = 0.00684379 0.0736553 0.435951 0.297971 0.119224 0.0559337  
0.00958461 0.000837271  
Year 20 Obs = 0 0.192057 0.381393 0.272035 0.0900435 0.0421654 0.0160501  
0.0062568  
Year 20 Pred = 0.00762441 0.096548 0.363464 0.321935 0.130911 0.0510917  
0.0239435 0.004482



Year 21 Obs = 0 0.0797956 0.53184 0.270244 0.0752752 0.0261399 0.0147406  
0.00196541  
Year 21 Pred = 0.00727537 0.0927398 0.438147 0.245827 0.131803 0.05234  
0.0204484 0.0114195  
Year 22 Obs = 0 0.0960949 0.431814 0.276631 0.108771 0.0521366 0.0224903  
0.012063  
Year 22 Pred = 0.0042353 0.0847619 0.417243 0.306555 0.10112 0.0525133  
0.0208418 0.0127294  
Year 23 Obs = 0 0.048398 0.439966 0.297639 0.126138 0.0507589 0.0202361  
0.0168634  
Year 23 Pred = 0.00615164 0.0542612 0.406901 0.313987 0.137262 0.043982  
0.0228227 0.0146326  
Year 24 Obs = 0 0.084207 0.228491 0.271093 0.181561 0.112332 0.0605758  
0.0617407  
Year 24 Pred = 0.00353109 0.0933184 0.301347 0.342142 0.154821 0.0657504  
0.0210874 0.018003  
Year 25 Obs = 0 0.0787154 0.466205 0.232997 0.121327 0.0579345 0.0277078  
0.0151134  
Year 25 Pred = 0.0046227 0.0472079 0.468248 0.223569 0.147536 0.0648077  
0.0275692 0.0164396  
fleet 2  
Year 1 Obs = 0.172408 0.608612 0.179438 0.0249561 0.00913884 0.00333919  
0.00105448 0.00105448  
Year 1 Pred = 0.949488 0.00238912 0.00122559 0.000252953 0.0466243 8.52265e-  
06 1.1162e-05 6.9237e-07  
Year 2 Obs = 0.0778358 0.59769 0.250119 0.0454042 0.0213574 0.00648632  
0.000474608 0.000632811  
Year 2 Pred = 0.808884 0.186806 0.000250908 0.000104821 2.14997e-05  
0.00393085 7.10135e-07 9.72597e-07  
Year 3 Obs = 0.0814915 0.508356 0.349416 0.049416 0.00961366 0.00161725  
8.98473e-05 0  
Year 3 Pred = 0.450776 0.486548 0.0615793 6.68496e-05 2.7493e-05 5.54787e-06  
0.000996313 4.15268e-07  
Year 4 Obs = 0.0274049 0.415828 0.493428 0.0472595 0.0118848 0.0033557  
0.000699105 0.000139821  
Year 4 Pred = 0.731322 0.156689 0.100958 0.0108487 1.16068e-05 4.70377e-06  
9.34546e-07 0.00016521  
Year 5 Obs = 0.0420725 0.482665 0.369497 0.0932996 0.00564862 0.00623296  
0.00019478 0.00038956  
Year 5 Pred = 0.693372 0.260078 0.0295931 0.015306 0.00162512 1.717e-06  
6.86442e-07 2.3702e-05  
Year 6 Obs = 0.054914 0.570351 0.306151 0.0624558 0.00589206 0.000235682 0  
0  
Year 6 Pred = 0.379639 0.495996 0.108245 0.0102834 0.0052734 0.0005544  
5.78582e-07 8.02547e-06  
Year 7 Obs = 0 0.495499 0.377951 0.0800068 0.0385595 0.00662477 0.000169866  
0.00118906  
Year 7 Pred = 0.72378 0.142947 0.10987 0.0204044 0.00192093 0.000974885  
0.000101208 1.53511e-06  
Year 8 Obs = 0.000823384 0.0201729 0.591601 0.294772 0.076163 0.0152326  
0.000411692 0.000823384  
Year 8 Pred = 0.621781 0.324987 0.0309899 0.0183697 0.00338317 0.00031486  
0.000158025 1.6436e-05  
Year 9 Obs = 0.00140449 0.100421 0.51264 0.293539 0.0821629 0.00842697  
0.000702247 0.000702247  
Year 9 Pred = 0.685666 0.226748 0.0769153 0.00621485 0.00369108 0.000668054  
6.19452e-05 3.42587e-05

Year 10 Obs = 0 0.142431 0.611857 0.194258 0.0432513 0.00745712 0.000745712  
 0  
 Year 10 Pred = 0.593327 0.31365 0.0657492 0.0239674 0.00193046 0.00114395  
 0.000202395 2.92435e-05  
 Year 11 Obs = 0 0.0214031 0.472652 0.414388 0.0778835 0.0124851 0.00118906  
 0  
 Year 11 Pred = 0.846888 0.11264 0.0313249 0.00646951 0.00235632 0.000189128  
 0.000109868 2.22078e-05  
 Year 12 Obs = 0 0.269211 0.575536 0.13173 0.0230005 0.000522739 0 0  
 Year 12 Pred = 0.614515 0.366215 0.0148958 0.00337888 0.000701292  
 0.000258941 2.03729e-05 1.43022e-05  
 Year 13 Obs = 0.00277649 0.119389 0.583989 0.232763 0.0532161 0.00647848  
 0.00138825 0  
 Year 13 Pred = 0.626841 0.265759 0.102134 0.00405918 0.000931512 0.000194063  
 7.14454e-05 9.56945e-06  
 Year 14 Obs = 0 0.0642528 0.493788 0.304934 0.117501 0.0188143 0.000709975  
 0  
 Year 14 Pred = 0.050343 0.335222 0.412995 0.190763 0.00821379 0.00190467  
 0.000394244 0.000164987  
 Year 15 Obs = 0 0.164492 0.620533 0.157119 0.0374362 0.015882 0.0036869  
 0.000850822  
 Year 15 Pred = 0.0235086 0.28729 0.58362 0.0867466 0.017902 0.000718259  
 0.000165752 4.88769e-05  
 Year 16 Obs = 0 0.0163305 0.600384 0.363112 0.0172911 0.00288184 0 0  
 Year 16 Pred = 0.0159613 0.145459 0.626176 0.194741 0.0146659 0.00284881  
 0.000113851 3.41173e-05  
 Year 17 Obs = 0.0118421 0.359868 0.456579 0.151316 0.0184211 0.00197368 0 0  
 Year 17 Pred = 0.0166474 0.129004 0.430788 0.353628 0.0643666 0.00462391  
 0.000895938 4.66456e-05  
 Year 18 Obs = 0.000712758 0.0498931 0.35923 0.412687 0.108339 0.0627227  
 0.00427655 0.00213828  
 Year 18 Pred = 0.0115937 0.134993 0.418552 0.275282 0.134329 0.0232363  
 0.00167076 0.000342369  
 Year 19 Obs = 0 0.028169 0.224225 0.510423 0.194366 0.0309859 0.0101408  
 0.00169014  
 Year 19 Pred = 0.013709 0.0993663 0.421675 0.285047 0.115687 0.0543806  
 0.00932026 0.000814193  
 Year 20 Obs = 0 0.0539986 0.278879 0.380041 0.228298 0.0430622 0.0123035  
 0.00341763  
 Year 20 Pred = 0.0151305 0.129037 0.348289 0.305104 0.125844 0.0492105  
 0.0230663 0.00431787  
 Year 21 Obs = 0 0.0351423 0.255338 0.459075 0.204626 0.0311388 0.0133452  
 0.00133452  
 Year 21 Pred = 0.0144518 0.124068 0.420261 0.233202 0.126825 0.0504618  
 0.0197184 0.011012  
 Year 22 Obs = 0 0.0262997 0.205505 0.435474 0.221407 0.075841 0.030581  
 0.00489297  
 Year 22 Pred = 0.0084712 0.114179 0.402978 0.292821 0.097974 0.0509789  
 0.0202367 0.0123601  
 Year 23 Obs = 0 0.0106054 0.26867 0.381352 0.198409 0.10517 0.0251878  
 0.0106054  
 Year 23 Pred = 0.0124239 0.0738042 0.396814 0.302839 0.134285 0.0431123  
 0.0223757 0.0143462  
 Year 24 Obs = 0 0.00888657 0.24621 0.434919 0.203346 0.0747517 0.0230005  
 0.00888657  
 Year 24 Pred = 0.00704566 0.125402 0.290343 0.326026 0.149643 0.0636755  
 0.0204258 0.0174385

Year 25 Obs = 0 0.00924499 0.223934 0.337956 0.229584 0.132512 0.048793  
0.0179764  
Year 25 Pred = 0.00936574 0.0644149 0.458093 0.216317 0.144796 0.0637285  
0.0271153 0.0161692  
fleet 3  
Year 1 Obs = 0 0 0 0 0 0 0 0  
Year 1 Pred = 0.0821733 0.882577 0.0189237 0.00633039 0.00947228 0.00031484  
0.00020617 2.55772e-06  
Year 2 Obs = 0 0 0 0 0 0 0 0  
Year 2 Pred = 0.00101118 0.996797 5.59596e-05 3.78912e-05 6.3092e-08  
0.0020975 1.89464e-07 5.18977e-08  
Year 3 Obs = 0 0 0 0 0 0 0 0  
Year 3 Pred = 0.000215838 0.994412 0.00526041 9.25583e-06 3.09022e-08  
1.13388e-06 0.000101814 8.4873e-09  
Year 4 Obs = 0 0 0 0 0 0 0 0  
Year 4 Pred = 0.00105879 0.968309 0.0260773 0.00454181 3.9447e-08 2.90685e-  
06 2.88767e-07 1.02097e-05  
Year 5 Obs = 0 0 0 0 0 0 0 0  
Year 5 Pred = 0.000618783 0.990715 0.00471173 0.00394988 3.40453e-06  
6.54056e-07 1.30743e-07 9.02882e-07  
Year 6 Obs = 0 0 0 0 0 0 0 0  
Year 6 Pred = 0.000177396 0.989293 0.00902397 0.00138951 5.78448e-06  
0.000110578 5.77008e-08 1.60073e-07  
Year 7 Obs = 0 0 0 0 0 0 0 0  
Year 7 Pred = 0.00113653 0.958124 0.0307801 0.00926503 7.08085e-06  
0.000653432 3.39182e-05 1.02893e-07  
Year 8 Obs = 0.310372 0.651982 0.0376452 0 0 0 0 0  
Year 8 Pred = 0.000444497 0.991679 0.00395247 0.00379737 5.67748e-06  
9.60777e-05 2.41101e-05 5.01536e-07  
Year 9 Obs = 0.338025 0.646259 0.0157166 0 0 0 0 0  
Year 9 Pred = 0.000696543 0.983224 0.0139401 0.00182564 8.80215e-06  
0.000289681 1.34303e-05 1.48553e-06  
Year 10 Obs = 0.206489 0.793511 0 0 0 0 0 0  
Year 10 Pred = 0.000436718 0.985433 0.00863407 0.00510126 3.33557e-06  
0.000359408 3.17944e-05 9.18776e-07  
Year 11 Obs = 0.421841 0.563915 0.0131483 0.00109569 0 0 0 0  
Year 11 Pred = 0.0017311 0.982795 0.0114236 0.00382399 1.13066e-05  
0.000165016 4.79306e-05 1.93765e-06  
Year 12 Obs = 0.378133 0.556484 0.06502 0.00036324 0 0 0 0  
Year 12 Pred = 0.000392023 0.997215 0.00169535 0.000623305 1.05022e-06  
7.05106e-05 2.7738e-06 3.89452e-07  
Year 13 Obs = 0.205618 0.603889 0.17753 0.0129636 0 0 0 0  
Year 13 Pred = 0.000542949 0.98257 0.0157829 0.00101669 1.89405e-06  
7.17495e-05 1.32075e-05 3.53803e-07  
Year 14 Obs = 0.181467 0.525097 0.265122 0.028314 0 0 0 0  
Year 14 Pred = 0.000415298 0.987195 0.00843205 0.00389604 1.29753e-06  
5.45035e-05 5.63917e-06 4.71977e-07  
Year 15 Obs = 0.0239334 0.663892 0.248699 0.0634755 0 0 0 0  
Year 15 Pred = 0.000225515 0.983828 0.0138563 0.00206021 3.28854e-06  
2.39009e-05 2.75699e-06 1.62593e-07  
Year 16 Obs = 0.0126984 0.395238 0.477778 0.114286 0 0 0 0  
Year 16 Pred = 0.000295662 0.961874 0.0287073 0.00893091 5.20222e-06  
0.000183053 3.65674e-06 2.19156e-07  
Year 17 Obs = 0.047619 0.306878 0.386243 0.259259 0 0 0 0  
Year 17 Pred = 0.000346605 0.958834 0.0221984 0.0182283 2.56628e-05  
0.000333952 3.23443e-05 3.36784e-07  
Year 18 Obs = 0.0319893 0.407531 0.416861 0.143619 0 0 0 0

Year 18 Pred = 0.000231848 0.9637 0.0207157 0.0136292 5.14406e-05 0.00161188  
5.79328e-05 2.37425e-06  
Year 19 Obs = 0.0220441 0.164329 0.460922 0.352705 0 0 0 0  
Year 19 Pred = 0.000366133 0.947377 0.0278728 0.0188478 5.91659e-05  
0.00503804 0.000431609 7.54068e-06  
Year 20 Obs = 0.0226337 0.203704 0.218107 0.555556 0 0 0 0  
Year 20 Pred = 0.000315801 0.961448 0.0179915 0.0157659 5.02976e-05  
0.00356289 0.000834772 3.12521e-05  
Year 21 Obs = 0.0247148 0.235741 0.418251 0.321293 0 0 0 0  
Year 21 Pred = 0.000313232 0.959959 0.022544 0.0125137 5.26383e-05  
0.00379394 0.000741043 8.27672e-05  
Year 22 Obs = 0.00319489 0.421725 0.408946 0.0894569 0.0399361 0.0159744  
0.0159744 0.00479233  
Year 22 Pred = 0.000198346 0.954369 0.0233522 0.0169743 4.39281e-05  
0.00414052 0.000821578 0.000100358  
Year 23 Obs = 0.00369004 0.143911 0.494465 0.195572 0.0811808 0.0332103  
0.0258303 0.0221402  
Year 23 Pred = 0.000439204 0.931412 0.0347188 0.0265052 9.0906e-05  
0.00528684 0.00137157 0.000175873  
Year 24 Obs = 0.0162602 0.166667 0.390244 0.211382 0.0894309 0.0528455  
0.0406504 0.0325203  
Year 24 Pred = 0.000151309 0.961387 0.015432 0.0173342 6.15393e-05  
0.00474351 0.000760591 0.000129868  
Year 25 Obs = 0.0114286 0.14 0.517143 0.148571 0.0828571 0.0457143  
0.0314286 0.0228571  
Year 25 Pred = 0.000375376 0.921639 0.0454408 0.0214647 0.000111131  
0.00886018 0.00188438 0.000224731  
fleet 4  
Year 1 Obs = 0 0 0 0 0 0 0 0  
Year 1 Pred = 0.0792542 0.0134375 0.872599 0.0159684 0.0177323 0.000606796  
0.000397355 4.92953e-06  
Year 2 Obs = 0 0 0 0 0 0 0 0  
Year 2 Pred = 0.042642 0.663574 0.112824 0.00417915 5.16418e-06 0.176755  
1.5966e-05 4.37339e-06  
Year 3 Obs = 0 0 0 0 0 0 0 0  
Year 3 Pred = 0.000806441 0.0586522 0.939682 9.04482e-05 2.24105e-07  
8.46589e-06 0.000760173 6.33687e-08  
Year 4 Obs = 0 0 0 0 0 0 0 0  
Year 4 Pred = 0.000830425 0.0119888 0.977843 0.00931663 6.00512e-08  
4.55589e-06 4.52582e-07 1.60016e-05  
Year 5 Obs = 0 0 0 0 0 0 0 0  
Year 5 Pred = 0.00245679 0.0620944 0.894393 0.0410161 2.62365e-05 5.18927e-  
06 1.03732e-06 7.16346e-06  
Year 6 Obs = 0 0 0 0 0 0 0 0  
Year 6 Pred = 0.000393256 0.0346202 0.956415 0.00805624 2.48893e-05  
0.000489849 2.55608e-07 7.09103e-07  
Year 7 Obs = 0 0 0 0 0 0 0 0  
Year 7 Pred = 0.00075094 0.00999356 0.972328 0.0160108 9.0809e-06  
0.000862754 4.47836e-05 1.35854e-07  
Year 8 Obs = 0 0 0 0 0 0 0 0  
Year 8 Pred = 0.00206502 0.072728 0.877895 0.0461402 5.11953e-05 0.00089195  
0.00022383 4.65607e-06  
Year 9 Obs = 0 0 0 0 0 0 0 0  
Year 9 Pred = 0.00101228 0.022557 0.968582 0.0069392 2.48291e-05 0.00084127  
3.90033e-05 4.31415e-06  
Year 10 Obs = 0 0 0 0 0 0 0 0

Year 10 Pred = 0.000986002 0.0351218 0.931986 0.0301227 1.46172e-05  
0.00162153 0.000143446 4.14522e-06  
Year 11 Obs = 0 0 0 0 0 0 0  
Year 11 Pred = 0.00301659 0.0270353 0.951733 0.0174282 3.82423e-05  
0.000574619 0.000166905 6.74733e-06  
Year 12 Obs = 0 0 0 0 0 0 0  
Year 12 Pred = 0.0039611 0.159062 0.818997 0.016472 2.05969e-05 0.0014237  
5.60068e-05 7.86357e-06  
Year 13 Obs = 0 0.604376 0.362808 0.0328168 0 0 0 0  
Year 13 Pred = 0.000701969 0.0200538 0.975581 0.00343786 4.753e-06  
0.00018537 3.41224e-05 9.14075e-07  
Year 14 Obs = 0 0.404255 0.524823 0.070922 0 0 0 0  
Year 14 Pred = 0.000967051 0.0362883 0.938729 0.0237276 5.86442e-06  
0.000253615 2.62401e-05 2.1962e-06  
Year 15 Obs = 0 0.741611 0.241611 0.0167785 0 0 0 0  
Year 15 Pred = 0.000329858 0.0227167 0.968984 0.00788141 9.33627e-06  
6.98599e-05 8.05841e-06 4.75244e-07  
Year 16 Obs = 0 0.220779 0.636364 0.142857 0 0 0 0  
Year 16 Pred = 0.000209435 0.0107559 0.972217 0.0165459 7.15254e-06  
0.000259114 5.17617e-06 3.10219e-07  
Year 17 Obs = 0.00595238 0.25 0.434524 0.309524 0 0 0 0  
Year 17 Pred = 0.000308028 0.0134515 0.943177 0.0423683 4.42666e-05  
0.000593062 5.74398e-05 5.9809e-07  
Year 18 Obs = 0.00208333 0.133333 0.497917 0.366667 0 0 0 0  
Year 18 Pred = 0.000221875 0.0145587 0.947813 0.0341127 9.55499e-05  
0.00308248 0.000110788 4.5404e-06  
Year 19 Obs = 0.0111732 0.256983 0.458101 0.273743 0 0 0 0  
Year 19 Pred = 0.000259988 0.0106197 0.946263 0.0350038 8.15464e-05  
0.00714887 0.000612444 1.07001e-05  
Year 20 Obs = 0 0.0634146 0.243902 0.692683 0 0 0 0  
Year 20 Pred = 0.000341093 0.016393 0.929064 0.0445368 0.000105445  
0.00768996 0.00180173 6.7453e-05  
Year 21 Obs = 0.00564972 0.169492 0.468927 0.355932 0 0 0 0  
Year 21 Pred = 0.00027589 0.0133474 0.949332 0.0288267 8.99892e-05  
0.00667762 0.00130429 0.000145677  
Year 22 Obs = 0 0.387387 0.432432 0.117117 0.036036 0.00900901 0.00900901  
0.00900901  
Year 22 Pred = 0.000167193 0.0126995 0.941112 0.037422 7.18715e-05  
0.00697447 0.0013839 0.000169047  
Year 23 Obs = 0 0.133333 0.609524 0.180952 0.047619 0.0190476 0.00952381 0  
Year 23 Pred = 0.000249804 0.00836271 0.944092 0.0394279 0.000100356  
0.00600882 0.00155887 0.00019989  
Year 24 Obs = 0 0.08 0.52 0.24 0.08 0.04 0.02 0.02  
Year 24 Pred = 0.000186837 0.0187401 0.911042 0.0559815 0.000147493  
0.0117047 0.00187677 0.000320451  
Year 25 Obs = 0 0.0887097 0.637097 0.169355 0.0564516 0.0241935 0.016129  
0.00806452  
Year 25 Pred = 0.000165676 0.00642139 0.958865 0.0247777 9.52022e-05  
0.00781445 0.00166197 0.000198207  
fleet 5  
Year 1 Obs = 0.177729 0.545789 0.226071 0.0362567 0.0138952 0 0.000258515 0  
Year 1 Pred = 0.936927 0.00252281 0.00137913 0.000302064 0.0588408 1.1321e-  
05 1.55447e-05 1.00706e-06  
Year 2 Obs = 0.10964 0.553058 0.237093 0.0638217 0.0251476 0.0104782 0  
0.00076205  
Year 2 Pred = 0.797305 0.197042 0.000282031 0.000125034 2.71031e-05  
0.00521578 9.87882e-07 1.4131e-06

Year 3 Obs = 0.130587 0.526352 0.276452 0.0579113 0.00841202 0.000286123 0  
0  
Year 3 Pred = 0.432113 0.499105 0.0673153 7.75493e-05 3.3706e-05 7.15907e-06  
0.0013479 5.86768e-07  
Year 4 Obs = 0.0905476 0.452015 0.395988 0.0427435 0.0133743 0.00533165 0 0  
Year 4 Pred = 0.711735 0.163184 0.112046 0.012777 1.44467e-05 6.1624e-06  
1.28362e-06 0.000237  
Year 5 Obs = 0.100594 0.551416 0.239566 0.0936236 0.0111006 0.00129077  
0.00240943 0  
Year 5 Pred = 0.675754 0.271241 0.0328895 0.0180521 0.00202561 2.25261e-06  
9.44174e-07 3.40494e-05  
Year 6 Obs = 0.059377 0.595041 0.263954 0.0569612 0.0231405 0.000127146  
0.000635728 0.000762873  
Year 6 Pred = 0.360258 0.503676 0.117137 0.0118093 0.00640004 0.000708207  
7.74878e-07 1.12257e-05  
Year 7 Obs = 0.0430723 0.576506 0.33243 0.0388554 0.00883534 0.000301205 0  
0  
Year 7 Pred = 0.702257 0.148421 0.121566 0.0239583 0.00238369 0.00127332  
0.00013859 2.19549e-06  
Year 8 Obs = 0.042516 0.313337 0.552126 0.0786255 0.00931858 0.00116482  
0.00291206 0  
Year 8 Pred = 0.602429 0.33695 0.0342399 0.0215384 0.0041922 0.000410659  
0.000216082 2.3473e-05  
Year 9 Obs = 0.0930416 0.7301 0.139431 0.0311017 0.0060622 0 0.000263574 0  
Year 9 Pred = 0.666146 0.235739 0.0852143 0.00730686 0.00458626 0.0008737  
8.49357e-05 4.90603e-05  
Year 10 Obs = 0.0141727 0.59443 0.371622 0.0130191 0.00659196 0.000164799 0  
0  
Year 10 Pred = 0.571998 0.323576 0.0722827 0.0279617 0.00238019 0.00148457  
0.000275376 4.15557e-05  
Year 11 Obs = 0.0165934 0.639544 0.320472 0.0179928 0 0.00539784 0 0  
Year 11 Pred = 0.834839 0.118823 0.0352136 0.00771776 0.00297071 0.000250972  
0.000152853 3.2269e-05  
Year 12 Obs = 0.0121651 0.60502 0.357715 0.0244841 0.000307977 0.000307977  
0 0  
Year 12 Pred = 0.597325 0.380929 0.0165115 0.0039746 0.000871818 0.000338824  
2.79484e-05 2.04919e-05  
Year 13 Obs = 0.117858 0.596449 0.253319 0.0274504 0.00417723 0.000149187  
0.000596748 0  
Year 13 Pred = 0.606122 0.274993 0.11262 0.0047499 0.00115197 0.000252604  
9.74994e-05 1.36393e-05  
Year 14 Obs = 0.0694528 0.453999 0.428743 0.0348767 0.0078172 0.00481058  
0.000300661 0  
Year 14 Pred = 0.03242 0.515727 0.342755 0.103571 0.00425535 0.000983073  
0.000203426 8.513e-05  
Year 15 Obs = 0.0165785 0.419465 0.495641 0.0505931 0.017579 0.000142918 0  
0  
Year 15 Pred = 0.0151643 0.442721 0.485167 0.0471757 0.00928998 0.000371338  
8.56685e-05 2.52614e-05  
Year 16 Obs = 0.000558114 0.160179 0.584345 0.204409 0.0382308 0.0122785 0  
0  
Year 16 Pred = 0.0118335 0.257632 0.598283 0.121723 0.00874723 0.00169278  
6.76316e-05 2.02665e-05  
Year 17 Obs = 0 0.110044 0.417682 0.388881 0.0737928 0.00902708 0.000573148  
0  
Year 17 Pred = 0.0134863 0.249669 0.449755 0.241526 0.0419494 0.00300227  
0.000581558 3.02773e-05

Year 18 Obs = 0 0.0489408 0.482591 0.3701 0.0791332 0.0146092 0.00462625 0  
Year 18 Pred = 0.00939609 0.261367 0.437161 0.188094 0.0875821 0.0150934  
0.00108494 0.00022232  
Year 19 Obs = 0 0.0740931 0.528266 0.292783 0.0824253 0.0217921 0.000640943  
0  
Year 19 Pred = 0.0116216 0.201239 0.460684 0.203726 0.0788973 0.0369484  
0.00633075 0.000553025  
Year 20 Obs = 0 0.158292 0.373064 0.336419 0.101813 0.0228561 0.00680015  
0.000755572  
Year 20 Pred = 0.0126922 0.258592 0.376522 0.215777 0.0849255 0.0330854  
0.0155036 0.00290211  
Year 21 Obs = 0.00030656 0.0594727 0.406806 0.369099 0.129062 0.0282036  
0.00613121 0.000919681  
Year 21 Pred = 0.0118832 0.243715 0.445342 0.161663 0.0838943 0.0332556  
0.0129912 0.00725493  
Year 22 Obs = 0 0.0519851 0.367186 0.384075 0.142136 0.0375082 0.0135995  
0.00350954  
Year 22 Pred = 0.00709929 0.228597 0.435228 0.206892 0.0660539 0.0342416  
0.0135887 0.00829945  
Year 23 Obs = 0.00526662 0.0467413 0.341014 0.377441 0.14944 0.0482774  
0.0263331 0.00548607  
Year 23 Pred = 0.0110194 0.156385 0.453578 0.226455 0.095818 0.0306475  
0.0159018 0.0101952  
Year 24 Obs = 0.000729927 0.0447689 0.291241 0.374453 0.183698 0.0579075  
0.0240876 0.0231144  
Year 24 Pred = 0.00608732 0.258835 0.323281 0.23748 0.104011 0.044093  
0.0141401 0.0120718  
Year 25 Obs = 0.000987167 0.017769 0.34847 0.325518 0.179911 0.078233  
0.0333169 0.0157947  
Year 25 Pred = 0.00822831 0.135198 0.518666 0.160225 0.10234 0.044874  
0.0190876 0.0113819  
fleet 6  
Year 1 Obs = 0.212871 0.787129 0 0 0 0 0 0  
Year 1 Pred = 0.718792 0.0250859 0.0135958 0.00200437 0.240474 2.67082e-05  
2.02681e-05 7.07132e-07  
Year 2 Obs = 0.158085 0.841915 0 0 0 0 0 0  
Year 2 Pred = 0.23644 0.757364 0.00107472 0.000320705 4.28162e-05 0.00475638  
4.97891e-07 3.83545e-07  
Year 3 Obs = 0.170732 0.829268 0 0 0 0 0 0  
Year 3 Pred = 0.0556179 0.83264 0.111335 8.63328e-05 2.31109e-05 2.83357e-06  
0.000294854 6.91242e-08  
Year 4 Obs = 0.162602 0.837398 0 0 0 0 0 0  
Year 4 Pred = 0.162592 0.483179 0.328911 0.025246 1.7581e-05 4.32906e-06  
4.98369e-07 4.95539e-05  
Year 5 Obs = 0.109729 0.890271 0 0 0 0 0 0  
Year 5 Pred = 0.141342 0.735337 0.0883976 0.0326581 0.00225699 1.44887e-06  
3.35635e-07 6.51837e-06  
Year 6 Obs = 0.0805471 0.919453 0 0 0 0 0 0  
Year 6 Pred = 0.0422235 0.765138 0.176415 0.0119714 0.00399591 0.000255248  
1.5435e-07 1.20421e-06  
Year 7 Obs = 0.0763889 0.923611 0 0 0 0 0 0  
Year 7 Pred = 0.159164 0.436004 0.354047 0.0469661 0.002878 0.000887454  
5.3384e-05 4.55434e-07  
Year 8 Obs = 0.135417 0.864583 0 0 0 0 0 0  
Year 8 Pred = 0.107194 0.777102 0.0782884 0.0331481 0.00397373 0.000224701  
6.53456e-05 3.82277e-06  
Year 9 Obs = 0.113208 0.886792 0 0 0 0 0 0

Year 9 Pred = 0.135751 0.622661 0.223144 0.012879 0.00497879 0.000547514  
 2.94168e-05 9.15059e-06  
 Year 10 Obs = 0.023976 0.976024 0 0 0 0 0  
 Year 10 Pred = 0.0960632 0.704348 0.15599 0.0406169 0.00212944 0.0007667  
 7.85997e-05 6.38763e-06  
 Year 11 Obs = 0.024602 0.975398 0 0 0 0 0  
 Year 11 Pred = 0.286781 0.529049 0.155438 0.0229308 0.00543626 0.000265115  
 8.92392e-05 1.01456e-05  
 Year 12 Obs = 0.0191657 0.980834 0 0 0 0 0  
 Year 12 Pred = 0.103219 0.853183 0.0366636 0.0059405 0.000802542 0.000180046  
 8.20802e-06 3.24099e-06  
 Year 13 Obs = 0.175182 0.824818 0 0 0 0 0  
 Year 13 Pred = 0.106981 0.629093 0.255423 0.0072512 0.00108312 0.000137103  
 2.92469e-05 2.20335e-06  
 Year 14 Obs = 0.139278 0.860722 0 0 0 0 0  
 Year 14 Pred = 0.101664 0.679501 0.191922 0.0265466 0.000344863 2.10856e-05  
 1.0941e-06 1.13208e-07  
 Year 15 Obs = 0.0384911 0.961509 0 0 0 0 0  
 Year 15 Pred = 0.0519485 0.637233 0.296777 0.0132096 0.000822477 8.70097e-06  
 5.03351e-07 3.66988e-08  
 Year 16 Obs = 0.0172786 0.590353 0.37581 0.0165587 0 0 0 0  
 Year 16 Pred = 0.0499096 0.45655 0.450575 0.0419628 0.000953455 4.88338e-05  
 4.89238e-07 3.62488e-08  
 Year 17 Obs = 0 0.403892 0.51592 0.0801887 0 0 0 0  
 Year 17 Pred = 0.0614286 0.477815 0.365799 0.089921 0.00493812 9.35352e-05  
 4.54329e-06 5.8484e-08  
 Year 18 Obs = 0.0471116 0.32922 0.553561 0.0701066 0 0 0 0  
 Year 18 Pred = 0.0436996 0.510737 0.363045 0.0715029 0.010527 0.000480135  
 8.65438e-06 4.38482e-07  
 Year 19 Obs = 0 0.314914 0.588519 0.0965665 0 0 0 0  
 Year 19 Pred = 0.0588762 0.428355 0.416741 0.0843607 0.0103299 0.00128032  
 5.50084e-05 1.18813e-06  
 Year 20 Obs = 0 0.524324 0.369231 0.0993763 0.00706861 0 0 0  
 Year 20 Pred = 0.060827 0.520703 0.322209 0.0845244 0.0105185 0.00108453  
 0.000127435 5.89813e-06  
 Year 21 Obs = 0.0533049 0.401564 0.404407 0.140725 0 0 0 0  
 Year 21 Pred = 0.056738 0.488925 0.379686 0.0630918 0.0103522 0.00108606  
 0.000106387 1.46899e-05  
 Year 22 Obs = 0.0298598 0.478367 0.365021 0.118221 0.00853138 0 0 0  
 Year 22 Pred = 0.0355424 0.480862 0.389079 0.0846631 0.00854652 0.00117255  
 0.000116683 1.76207e-05  
 Year 23 Obs = 0.0499706 0.298648 0.466784 0.180482 0.00411523 0 0 0  
 Year 23 Pred = 0.0615794 0.367191 0.452606 0.103438 0.0138383 0.00117144  
 0.000152413 2.41612e-05  
 Year 24 Obs = 0.109767 0.498271 0.31936 0.0691443 0.00345722 0 0 0  
 Year 24 Pred = 0.0312177 0.557719 0.296036 0.0995453 0.0137852 0.00154665  
 0.000124373 2.62536e-05  
 Year 25 Obs = 0.0883694 0.314709 0.505701 0.0826682 0.00741163 0.00114025 0  
 0  
 Year 25 Pred = 0.0473619 0.326967 0.533082 0.075382 0.0152237 0.00176669  
 0.000188438 2.77828e-05

Proportions of Discards at age by fleet

fleet 1  
 Year 1 Obs = 0 0 0 0 0 0 0 0  
 Year 1 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 2 Obs = 0 0 0 0 0 0 0 0



Year 2 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 3 Obs = 0 0 0 0 0 0 0 0  
Year 3 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 4 Obs = 0 0 0 0 0 0 0 0  
Year 4 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 5 Obs = 0 0 0 0 0 0 0 0  
Year 5 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 6 Obs = 0 0 0 0 0 0 0 0  
Year 6 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 7 Obs = 0 0 0 0 0 0 0 0  
Year 7 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 8 Obs = 0 0 0 0 0 0 0 0  
Year 8 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 9 Obs = 0 0 0 0 0 0 0 0  
Year 9 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 10 Obs = 0 0 0 0 0 0 0 0  
Year 10 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 11 Obs = 0 0 0 0 0 0 0 0  
Year 11 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 12 Obs = 0 0 0 0 0 0 0 0  
Year 12 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 13 Obs = 0 0 0 0 0 0 0 0  
Year 13 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 14 Obs = 0 0 0 0 0 0 0 0  
Year 14 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 15 Obs = 0 0 0 0 0 0 0 0  
Year 15 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 16 Obs = 0 0 0 0 0 0 0 0  
Year 16 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 17 Obs = 0 0 0 0 0 0 0 0  
Year 17 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 18 Obs = 0 0 0 0 0 0 0 0  
Year 18 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 19 Obs = 0 0 0 0 0 0 0 0  
Year 19 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 20 Obs = 0 0 0 0 0 0 0 0  
Year 20 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 21 Obs = 0 0 0 0 0 0 0 0  
Year 21 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 22 Obs = 0 0 0 0 0 0 0 0  
Year 22 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 23 Obs = 0 0 0 0 0 0 0 0  
Year 23 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 24 Obs = 0 0 0 0 0 0 0 0  
Year 24 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 25 Obs = 0 0 0 0 0 0 0 0  
Year 25 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
fleet 2  
Year 1 Obs = 0 0 0 0 0 0 0 0  
Year 1 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 2 Obs = 0 0 0 0 0 0 0 0  
Year 2 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 3 Obs = 0 0 0 0 0 0 0 0  
Year 3 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 4 Obs = 0 0 0 0 0 0 0 0  
Year 4 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 5 Obs = 0 0 0 0 0 0 0 0

Year 5 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 6 Obs = 0 0 0 0 0 0 0 0  
Year 6 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 7 Obs = 0 0 0 0 0 0 0 0  
Year 7 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 8 Obs = 0 0 0 0 0 0 0 0  
Year 8 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 9 Obs = 0 0 0 0 0 0 0 0  
Year 9 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 10 Obs = 0 0 0 0 0 0 0 0  
Year 10 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 11 Obs = 0 0 0 0 0 0 0 0  
Year 11 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 12 Obs = 0 0 0 0 0 0 0 0  
Year 12 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 13 Obs = 0 0 0 0 0 0 0 0  
Year 13 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 14 Obs = 0 0 0 0 0 0 0 0  
Year 14 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 15 Obs = 0 0 0 0 0 0 0 0  
Year 15 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 16 Obs = 0 0 0 0 0 0 0 0  
Year 16 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 17 Obs = 0 0 0 0 0 0 0 0  
Year 17 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 18 Obs = 0 0 0 0 0 0 0 0  
Year 18 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 19 Obs = 0 0 0 0 0 0 0 0  
Year 19 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 20 Obs = 0 0 0 0 0 0 0 0  
Year 20 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 21 Obs = 0 0 0 0 0 0 0 0  
Year 21 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 22 Obs = 0 0 0 0 0 0 0 0  
Year 22 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 23 Obs = 0 0 0 0 0 0 0 0  
Year 23 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 24 Obs = 0 0 0 0 0 0 0 0  
Year 24 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 25 Obs = 0 0 0 0 0 0 0 0  
Year 25 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
fleet 3  
Year 1 Obs = 0 0 0 0 0 0 0 0  
Year 1 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 2 Obs = 0 0 0 0 0 0 0 0  
Year 2 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 3 Obs = 0 0 0 0 0 0 0 0  
Year 3 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 4 Obs = 0 0 0 0 0 0 0 0  
Year 4 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 5 Obs = 0 0 0 0 0 0 0 0  
Year 5 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 6 Obs = 0 0 0 0 0 0 0 0  
Year 6 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 7 Obs = 0 0 0 0 0 0 0 0  
Year 7 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 8 Obs = 0 0 0 0 0 0 0 0

Year 8 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 9 Obs = 0 0 0 0 0 0 0 0  
Year 9 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 10 Obs = 0 0 0 0 0 0 0 0  
Year 10 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 11 Obs = 0 0 0 0 0 0 0 0  
Year 11 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 12 Obs = 0 0 0 0 0 0 0 0  
Year 12 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 13 Obs = 0 0 0 0 0 0 0 0  
Year 13 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 14 Obs = 0 0 0 0 0 0 0 0  
Year 14 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 15 Obs = 0 0 0 0 0 0 0 0  
Year 15 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 16 Obs = 0 0 0 0 0 0 0 0  
Year 16 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 17 Obs = 0 0 0 0 0 0 0 0  
Year 17 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 18 Obs = 0 0 0 0 0 0 0 0  
Year 18 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 19 Obs = 0 0 0 0 0 0 0 0  
Year 19 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 20 Obs = 0 0 0 0 0 0 0 0  
Year 20 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 21 Obs = 0 0 0 0 0 0 0 0  
Year 21 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 22 Obs = 0 0 0 0 0 0 0 0  
Year 22 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 23 Obs = 0 0 0 0 0 0 0 0  
Year 23 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 24 Obs = 0 0 0 0 0 0 0 0  
Year 24 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 25 Obs = 0 0 0 0 0 0 0 0  
Year 25 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
fleet 4  
Year 1 Obs = 0 0 0 0 0 0 0 0  
Year 1 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 2 Obs = 0 0 0 0 0 0 0 0  
Year 2 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 3 Obs = 0 0 0 0 0 0 0 0  
Year 3 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 4 Obs = 0 0 0 0 0 0 0 0  
Year 4 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 5 Obs = 0 0 0 0 0 0 0 0  
Year 5 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 6 Obs = 0 0 0 0 0 0 0 0  
Year 6 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 7 Obs = 0 0 0 0 0 0 0 0  
Year 7 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 8 Obs = 0 0 0 0 0 0 0 0  
Year 8 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 9 Obs = 0 0 0 0 0 0 0 0  
Year 9 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 10 Obs = 0 0 0 0 0 0 0 0  
Year 10 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 11 Obs = 0 0 0 0 0 0 0 0

Year 11 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 12 Obs = 0 0 0 0 0 0 0 0  
Year 12 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 13 Obs = 0 0 0 0 0 0 0 0  
Year 13 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 14 Obs = 0 0 0 0 0 0 0 0  
Year 14 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 15 Obs = 0 0 0 0 0 0 0 0  
Year 15 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 16 Obs = 0 0 0 0 0 0 0 0  
Year 16 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 17 Obs = 0 0 0 0 0 0 0 0  
Year 17 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 18 Obs = 0 0 0 0 0 0 0 0  
Year 18 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 19 Obs = 0 0 0 0 0 0 0 0  
Year 19 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 20 Obs = 0 0 0 0 0 0 0 0  
Year 20 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 21 Obs = 0 0 0 0 0 0 0 0  
Year 21 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 22 Obs = 0 0 0 0 0 0 0 0  
Year 22 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 23 Obs = 0 0 0 0 0 0 0 0  
Year 23 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 24 Obs = 0 0 0 0 0 0 0 0  
Year 24 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 25 Obs = 0 0 0 0 0 0 0 0  
Year 25 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
fleet 5  
Year 1 Obs = 0 0 0 0 0 0 0 0  
Year 1 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 2 Obs = 0 0 0 0 0 0 0 0  
Year 2 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 3 Obs = 0 0 0 0 0 0 0 0  
Year 3 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 4 Obs = 0 0 0 0 0 0 0 0  
Year 4 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 5 Obs = 0 0 0 0 0 0 0 0  
Year 5 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 6 Obs = 0 0 0 0 0 0 0 0  
Year 6 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 7 Obs = 0 0 0 0 0 0 0 0  
Year 7 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 8 Obs = 0 0 0 0 0 0 0 0  
Year 8 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 9 Obs = 0 0 0 0 0 0 0 0  
Year 9 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 10 Obs = 0 0 0 0 0 0 0 0  
Year 10 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 11 Obs = 0 0 0 0 0 0 0 0  
Year 11 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 12 Obs = 0 0 0 0 0 0 0 0  
Year 12 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 13 Obs = 0 0 0 0 0 0 0 0  
Year 13 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 14 Obs = 0 0 0 0 0 0 0 0

Year 14 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 15 Obs = 0 0 0 0 0 0 0 0  
Year 15 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 16 Obs = 0 0 0 0 0 0 0 0  
Year 16 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 17 Obs = 0 0 0 0 0 0 0 0  
Year 17 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 18 Obs = 0 0 0 0 0 0 0 0  
Year 18 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 19 Obs = 0 0 0 0 0 0 0 0  
Year 19 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 20 Obs = 0 0 0 0 0 0 0 0  
Year 20 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 21 Obs = 0 0 0 0 0 0 0 0  
Year 21 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 22 Obs = 0 0 0 0 0 0 0 0  
Year 22 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 23 Obs = 0 0 0 0 0 0 0 0  
Year 23 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 24 Obs = 0 0 0 0 0 0 0 0  
Year 24 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 25 Obs = 0 0 0 0 0 0 0 0  
Year 25 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
fleet 6  
Year 1 Obs = 0 0 0 0 0 0 0 0  
Year 1 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 2 Obs = 0 0 0 0 0 0 0 0  
Year 2 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 3 Obs = 0 0 0 0 0 0 0 0  
Year 3 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 4 Obs = 0 0 0 0 0 0 0 0  
Year 4 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 5 Obs = 0 0 0 0 0 0 0 0  
Year 5 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 6 Obs = 0 0 0 0 0 0 0 0  
Year 6 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 7 Obs = 0 0 0 0 0 0 0 0  
Year 7 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 8 Obs = 0 0 0 0 0 0 0 0  
Year 8 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 9 Obs = 0 0 0 0 0 0 0 0  
Year 9 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 10 Obs = 0 0 0 0 0 0 0 0  
Year 10 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 11 Obs = 0 0 0 0 0 0 0 0  
Year 11 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 12 Obs = 0 0 0 0 0 0 0 0  
Year 12 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 13 Obs = 0 0 0 0 0 0 0 0  
Year 13 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 14 Obs = 0 0 0 0 0 0 0 0  
Year 14 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 15 Obs = 0 0 0 0 0 0 0 0  
Year 15 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 16 Obs = 0 0 0 0 0 0 0 0  
Year 16 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 17 Obs = 0 0 0 0 0 0 0 0

Year 17 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 18 Obs = 0 0 0 0 0 0 0 0  
 Year 18 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 19 Obs = 0 0 0 0 0 0 0 0  
 Year 19 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 20 Obs = 0 0 0 0 0 0 0 0  
 Year 20 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 21 Obs = 0 0 0 0 0 0 0 0  
 Year 21 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 22 Obs = 0 0 0 0 0 0 0 0  
 Year 22 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 23 Obs = 0 0 0 0 0 0 0 0  
 Year 23 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 24 Obs = 0 0 0 0 0 0 0 0  
 Year 24 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 25 Obs = 0 0 0 0 0 0 0 0  
 Year 25 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15

F Reference Points Using Final Year Selectivity and Freport options

refpt	F	slope to plot on SRR			
F0.1	0.153305	0.318993			
Fmax	0.280737	0.51694			
F30%SPR	0.230649	0.43601			
F40%SPR	0.158871	0.327012			
Fmsy	0.204411	0.395064	SSBmsy	6.35383e+25	MSY
	1.21161e+25				
Fcurrent	0.586764	1.03479			

Stock-Recruitment Relationship Parameters

alpha = 2.91798e+25  
 beta = 1.03225e+25  
 unexpl = 2.25984e+26  
 steepness = 0.851259

Spawning Stock, Obs Recruits(year+1), Pred Recruits(year+1), standardized residual

Year	SSB	Obs Recruits	Pred Recruits	Standardized Residual
init	xxxx	79921.3	6895.37	5.1869
1982	7668.5	123682	21677.4	3.68653
1983	13116.5	44589	37077.8	0.390507
1984	12626.9	66874.1	35693.9	1.32908
1985	11034.5	72109.2	31192.5	1.774
1986	12582	22478.1	35566.8	-0.971406
1987	10319.1	40624.6	29170.2	0.701182
1988	6190.88	26168.4	17500.4	0.8517
1989	5943.41	33824.5	16800.9	1.48134
1990	7411.88	27610.9	20952	0.584232
1991	5330.35	49273	15067.9	2.50817
1992	5217.14	36531.7	14747.9	1.92024
1993	8993.8	41893.3	25423.7	1.05729
1994	12864.6	42575	36365.9	0.333704
1995	17270.1	29748.6	48819.3	-1.04861
1996	19359	28798.2	54724.3	-1.35907
1997	19800.3	32946.7	55971.8	-1.12188
1998	21405.5	24247.8	60509.1	-1.93587
1999	21545.2	28964.3	60904.2	-1.57339
2000	21923.9	30381.5	61974.6	-1.50914
2001	25023.3	32213.9	70736.1	-1.66509
2002	28221.5	21683.1	79776.9	-2.75774

2003	30733.3	33222.8	86877.1	-2.03492
2004	28544.5	16870.6	80689.8	-3.31309
2005	25558.8	22026.7	72249.9	-2.51466
2006	23825.8	xxxx	67350.9	

Root Mean Square Error computed from Standardized Residuals

Component	#resids	RMSE
_Catch_Fleet_1	25	1.15006
_Catch_Fleet_2	25	0.211925
_Catch_Fleet_3	25	4.55708
_Catch_Fleet_4	25	2.81316
_Catch_Fleet_5	25	0.495593
_Catch_Fleet_6	25	0.0692742
Catch_Fleet_Total	150	2.24718
_Discard_Fleet_1	0	0
_Discard_Fleet_2	0	0
_Discard_Fleet_3	0	0
_Discard_Fleet_4	0	0
_Discard_Fleet_5	0	0
_Discard_Fleet_6	0	0
Discard_Fleet_Total	0	0
_Index_1	15	3.1099
_Index_2	25	2.5973
_Index_3	25	1.48293
_Index_4	25	7.45039
_Index_5	25	8.08223
_Index_6	23	1.77101
_Index_7	23	1.52043
_Index_8	25	3.99163
_Index_9	17	2.14715
_Index_10	19	1.14883
_Index_11	21	2.67517
_Index_12	25	1.81917
_Index_13	25	1.34097
Index_Total	293	3.82846
Nyear1	7	3.34493
Fmult_Year1	6	9.02474
_Fmult_devs_Fleet_1	0	0
_Fmult_devs_Fleet_2	0	0
_Fmult_devs_Fleet_3	0	0
_Fmult_devs_Fleet_4	0	0
_Fmult_devs_Fleet_5	0	0
_Fmult_devs_Fleet_6	0	0
Fmult_devs_Total	0	0
Recruit_devs	0	0
Fleet_Sel_params	32	7.70217
Index_Sel_params	68	0.756962
q_year1	0	0
q_devs	0	0
SRR_steepness	0	0
SRR_unexpl_S	0	0

Projections not requested

that's all

**SS2 ALTERNATIVE RUN (F08 MULTI.REP)**

Code\_version: \_\_2.00o;\_01/31/08;\_Stock\_Synthesis\_2\_by\_Richard\_Methot\_(NOAA);\_  
using\_Otter\_Research\_ADMB\_7.0.1

Time: Wed Mar 19 08:48:34 2008

Data\_File: F08\_MULTI.DAT  
Control\_File: F08\_MULTI\_IAN.CTL

Convergence\_Level:  
Hessian:  
Sum\_of\_months\_on\_read\_was:\_ 12 rescaled\_to\_sum\_to: 1

LIKELIHOOD 4950.75  
indices 3153.61  
discard 0  
length\_comps 0  
age\_comps 1769.74  
size-at-age 0  
mean\_body\_wt 0  
Equil\_catch 0  
catch 27.4002  
Recruitment 0  
Parm\_priors 0  
Parm\_devs 0  
penalties 0  
Forecast\_Recruitment 0

	Fleet	surv_lambda	surv_like	disc_lambda	disc_like	length_lambda	length_like	age_lambda	age_like	sizeage_lambda	sizeage_like
1	0	0	0	0	0	0	0	1	193.803	0	0
2	0	0	0	0	0	0	0	1	722.843	0	0
3	0	0	0	0	0	0	0	1	286.395	0	0
4	0	0	0	0	0	0	0	1	175.194	0	0
5	0	0	0	0	0	0	0	1	213.2	0	0
6	0	0	0	0	0	0	0	1	178.307	0	0
7	1	154.773	0	0	0	0	0	0	0	0	0
8	1	44.0208	0	0	0	0	0	0	0	0	0
9	1	105.618	0	0	0	0	0	0	0	0	0
10	1	143.636	0	0	0	0	0	0	0	0	0
11	1	79.8689	0	0	0	0	0	0	0	0	0
12	1	127.796	0	0	0	0	0	0	0	0	0
13	1	82.6969	0	0	0	0	0	0	0	0	0
14	1	175.064	0	0	0	0	0	0	0	0	0
15	1	41.067	0	0	0	0	0	0	0	0	0
16	1	33.4215	0	0	0	0	0	0	0	0	0
17	1	67.72	0	0	0	0	0	0	0	0	0
18	1	25.9998	0	0	0	0	0	0	0	0	0
19	1	73.3038	0	0	0	0	0	0	0	0	0
20	1	48.2303	0	0	0	0	0	0	0	0	0
21	1	255.747	0	0	0	0	0	0	0	0	0
22	1	180.776	0	0	0	0	0	0	0	0	0
23	1	518.654	0	0	0	0	0	0	0	0	0
24	1	193.801	0	0	0	0	0	0	0	0	0
25	1	43.3054	0	0	0	0	0	0	0	0	0



```

26 1 40.5962 0 0 0 0 0 0 0 0
27 1 41.73 0 0 0 0 0 0 0 0
28 1 36.0263 0 0 0 0 0 0 0 0
29 1 19.9886 0 0 0 0 0 0 0 0
30 1 13.9444 0 0 0 0 0 0 0 0
31 1 41.9613 0 0 0 0 0 0 0 0
32 1 41.3827 0 0 0 0 0 0 0 0
33 1 45.0029 0 0 0 0 0 0 0 0
34 1 41.8502 0 0 0 0 0 0 0 0
35 1 42.5269 0 0 0 0 0 0 0 0
36 1 24.6281 0 0 0 0 0 0 0 0
37 1 60.3497 0 0 0 0 0 0 0 0
38 1 36.1547 0 0 0 0 0 0 0 0
39 1 29.5795 0 0 0 0 0 0 0 0
40 1 53.5634 0 0 0 0 0 0 0 0
41 1 24.9973 0 0 0 0 0 0 0 0
42 1 23.1701 0 0 0 0 0 0 0 0
43 1 27.2461 0 0 0 0 0 0 0 0
44 1 49.3891 0 0 0 0 0 0 0 0
45 1 64.0237 0 0 0 0 0 0 0 0

```

Source Lambda Like

```

mean_body_wt 0 0
Equil_catch 0 0
Catch 10 2.74002
Recruitment 0 0
Parm_priors 0 0
Parm_devs 1 0
penalties 0

```

```

Variance_adjustments_to_input_values 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42
43 44 45

```

```

Index_extra_CV 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Discard_extra_CV 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
MeanBodyWt_extra_CV 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
effN_mult_Lencomp 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
effN_mult_Agecomp 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
effN_mult_Len-at-age 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

```

PARAMETERS

```

Num Value Phase Min Max Init Prior PR_type SD Active_Cnt Prior_Like Bound
M-G_parmsUsing_offset_approach_#:_3
Gender:_1_Pattern:_1
1 0.2 -3
2 0 -3
3 28.1 -2
4 60.2 -2
5 0.2052 -3
6 0.1 -2

```

```

7 0 -3
biology_parms
8 2.44e-006 -3
9 3.34694 -3
10 28.1 -3
11 -0.25 -3
12 1 -3
13 0 -3
recrdist_by_growthpattern:1
14 0 -3
recrdist_by_area:1
15 0 -3
recrdist_by_seas:1
16 4 -3
cohort_growth_dev:2
17 1 -3
MGparm_env_linkages
MG_parm_blockparms
M-G_parm_devs 1
1_YR1982 0 -

MGParm_Block_Assignments
SR_parms
1 11.0006 1 3 31 10.1121 0 -1 99 1 0
2 0.879485 1 0.2 1 0.8 0 -1 99 2 0
3 0.6 -1
4 0 -1
5 -0.47173 1 -5 5 0 0 -1 99 3 0
6 0 -1
Recr_Devs
1982 0.480175 - - - - - - - 4
1983 0.666252 - - - - - - - 5
1984 0.183554 - - - - - - - 6
1985 0.450982 - - - - - - - 7
1986 0.523818 - - - - - - - 8
1987 0.193761 - - - - - - - 9
1988 -0.985401 - - - - - - - 10
1989 0.150743 - - - - - - - 11
1990 0.420276 - - - - - - - 12
1991 0.167928 - - - - - - - 13
1992 0.363846 - - - - - - - 14
1993 0.27197 - - - - - - - 15
1994 0.152032 - - - - - - - 16
1995 0.288818 - - - - - - - 17
1996 -0.133266 - - - - - - - 18
1997 -0.0934432 - - - - - - - 19
1998 -0.0834052 - - - - - - - 20
1999 -0.382198 - - - - - - - 21
2000 -0.216948 - - - - - - - 22
2001 -0.217438 - - - - - - - 23
2002 -0.141447 - - - - - - - 24
2003 -0.53948 - - - - - - - 25
2004 -0.243228 - - - - - - - 26
2005 -0.960752 - - - - - - - 27
2006 -0.317149 - - - - - - - 28
init_F_parms
1 1.2679 1 0 2 1 1 -1 10 29 0

```

2 0 -1  
3 0 -1  
4 0 -1  
5 0 -1  
6 0 -1  
Q\_parms  
sel\_parms  
#\_size\_sel:\_1  
#\_male  
#\_size\_sel:\_2  
#\_male  
#\_size\_sel:\_3  
#\_male  
#\_size\_sel:\_4  
#\_male  
#\_size\_sel:\_5  
#\_male  
#\_size\_sel:\_6  
#\_male  
#\_size\_sel:\_7  
#\_male  
#\_size\_sel:\_8  
#\_male  
#\_size\_sel:\_9  
#\_male  
#\_size\_sel:\_10  
#\_male  
#\_size\_sel:\_11  
#\_male  
#\_size\_sel:\_12  
#\_male  
#\_size\_sel:\_13  
#\_male  
#\_size\_sel:\_14  
#\_male  
#\_size\_sel:\_15  
#\_male  
#\_size\_sel:\_16  
#\_male  
#\_size\_sel:\_17  
#\_male  
#\_size\_sel:\_18  
#\_male  
#\_size\_sel:\_19  
#\_male  
#\_size\_sel:\_20  
#\_male  
#\_size\_sel:\_21  
#\_male  
#\_size\_sel:\_22  
#\_male  
#\_size\_sel:\_23  
#\_male  
#\_size\_sel:\_24  
#\_male  
#\_size\_sel:\_25  
#\_male

```

#_size_sel:_26
#_male
#_size_sel:_27
#_male
#_size_sel:_28
#_male
#_size_sel:_29
#_male
#_size_sel:_30
#_male
#_size_sel:_31
#_male
#_size_sel:_32
#_male
#_size_sel:_33
#_male
#_size_sel:_34
#_male
#_size_sel:_35
#_male
#_size_sel:_36
#_male
#_size_sel:_37
#_male
#_size_sel:_38
#_male
#_size_sel:_39
#_male
#_size_sel:_40
#_male
#_size_sel:_41
#_male
#_size_sel:_42
#_male
#_size_sel:_43
#_male
#_size_sel:_44
#_male
#_size_sel:_45
#_male
#_age_sel:_1
1 1.95761 2 0.5 9 4 4 -1 99 30 0
2 -3 -3
3 3.97162e-009 3 0 9 2 2 -1 99 31 0 LO
4 9 -3
5 -999 -2
6 -999 -2
#_male
#_age_sel:_2
7 2.82246 2 0.5 9 4 4 -1 99 32 0
8 -3 -3
9 0.544786 3 0 9 2 2 -1 99 33 0
10 9 -3
11 -999 -2
12 -999 -2
#_male
#_age_sel:_3

```

13 1.02748 2 0.5 9 4 4 -1 99 34 0  
14 2.99975 3 -9 3 -3 -3 -1 99 35 0 HI  
15 3.78419e-008 3 0 9 2 2 -1 99 36 0 LO  
16 8.93608 3 0 9 9 9 -1 99 37 0 HI  
17 -999 -2  
18 -8.13933 3 -10 10 0 5 -1 99 38 0  
#\_male  
#\_age\_sel:\_4  
19 1.83597 2 0.5 9 4 4 -1 99 39 0  
20 -8.99999 3 -9 3 -3 -3 -1 99 40 0 LO  
21 4.49397e-007 3 0 9 2 2 -1 99 41 0 LO  
22 1.63644e-007 3 0 9 9 9 -1 99 42 0 LO  
23 -999 -2  
24 -9.99936 3 -10 10 0 5 -1 99 43 0 LO  
#\_male  
#\_age\_sel:\_5  
25 1.72793 2 0.5 9 4 4 -1 99 44 0  
26 -3 -3  
27 3.70491e-009 3 0 9 2 2 -1 99 45 0 LO  
28 9 -3  
29 -999 -2  
30 -999 -2  
#\_male  
#\_age\_sel:\_6  
31 1.60547 2 0.5 9 4 4 -1 99 46 0  
32 -9 3 -9 3 -3 -3 -1 99 47 0 LO  
33 2.23577e-008 3 0 9 2 2 -1 99 48 0 LO  
34 1.65515e-007 3 0 9 9 9 -1 99 49 0 LO  
35 -999 -2  
36 -9.99912 3 -10 10 0 5 -1 99 50 0 LO  
#\_male  
#\_age\_sel:\_7  
37 1 -3  
38 1 -3  
#\_male  
#\_age\_sel:\_8  
39 2 -3  
40 2 -3  
#\_male  
#\_age\_sel:\_9  
41 3 -3  
42 3 -3  
#\_male  
#\_age\_sel:\_10  
43 4 -3  
44 4 -3  
#\_male  
#\_age\_sel:\_11  
45 5 -3  
46 15 -3  
#\_male  
#\_age\_sel:\_12  
47 1 -3  
48 1 -3  
#\_male  
#\_age\_sel:\_13  
49 2 -3

50 2 -3  
#\_male  
#\_age\_sel:\_14  
51 3 -3  
52 3 -3  
#\_male  
#\_age\_sel:\_15  
53 4 -3  
54 4 -3  
#\_male  
#\_age\_sel:\_16  
55 5 -3  
56 15 -3  
#\_male  
#\_age\_sel:\_17  
57 0 -3  
58 0 -3  
#\_male  
#\_age\_sel:\_18  
59 2 -3  
60 2 -3  
#\_male  
#\_age\_sel:\_19  
61 3 -3  
62 3 -3  
#\_male  
#\_age\_sel:\_20  
63 4 -3  
64 4 -3  
#\_male  
#\_age\_sel:\_21  
65 2 -3  
66 2 -3  
#\_male  
#\_age\_sel:\_22  
67 3 -3  
68 3 -3  
#\_male  
#\_age\_sel:\_23  
69 3 -3  
70 3 -3  
#\_male  
#\_age\_sel:\_24  
71 4 -3  
72 4 -3  
#\_male  
#\_age\_sel:\_25  
73 2 -3  
74 2 -3  
#\_male  
#\_age\_sel:\_26  
75 3 -3  
76 3 -3  
#\_male  
#\_age\_sel:\_27  
77 4 -3  
78 4 -3

#\_male  
#\_age\_sel:\_28  
79 2 -3  
80 2 -3  
#\_male  
#\_age\_sel:\_29  
81 3 -3  
82 3 -3  
#\_male  
#\_age\_sel:\_30  
83 4 -3  
84 4 -3  
#\_male  
#\_age\_sel:\_31  
85 5 -3  
86 15 -3  
#\_male  
#\_age\_sel:\_32  
87 3 -3  
88 3 -3  
#\_male  
#\_age\_sel:\_33  
89 4 -3  
90 4 -3  
#\_male  
#\_age\_sel:\_34  
91 1 -3  
92 1 -3  
#\_male  
#\_age\_sel:\_35  
93 2 -3  
94 15 -3  
#\_male  
#\_age\_sel:\_36  
95 1 -3  
96 1 -3  
#\_male  
#\_age\_sel:\_37  
97 2 -3  
98 2 -3  
#\_male  
#\_age\_sel:\_38  
99 3 -3  
100 3 -3  
#\_male  
#\_age\_sel:\_39  
101 4 -3  
102 15 -3  
#\_male  
#\_age\_sel:\_40  
103 0 -3  
104 0 -3  
#\_male  
#\_age\_sel:\_41  
105 0 -3  
106 0 -3  
#\_male

```

#_age_sel:_42
107 0 -3
108 0 -3
#_male
#_age_sel:_43
109 0 -3
110 0 -3
#_male
#_age_sel:_44
111 0 -3
112 0 -3
#_male
#_age_sel:_45
113 4 -3
114 15 -3
#_male
sel_parm_env_linkages
sel_parm_blockparms
115 2.612 2 0.5 9 4 4 -1 99 51 0
116 0.132447 3 0 9 2 2 -1 99 52 0
117 3.19599 2 0.5 9 4 4 -1 99 53 0
118 0.399783 3 0 9 2 2 -1 99 54 0
119 1.81934 2 0.5 9 4 4 -1 99 55 0
120 0.173406 3 0 9 2 2 -1 99 56 0
121 5.79422 3 0 9 9 9 -1 99 57 0
122 8.37467 3 -10 10 0 5 -1 99 58 0
123 2.12927 2 0.5 9 4 4 -1 99 59 0
124 1.06391e-008 3 0 9 2 2 -1 99 60 0 LO
125 7.11083e-008 3 0 9 9 9 -1 99 61 0 LO
126 0.00212228 3 -10 10 0 5 -1 99 62 0
127 2.89121 2 0.5 9 4 4 -1 99 63 0
128 0.491235 3 0 9 2 2 -1 99 64 0
129 1.55718 2 0.5 9 4 4 -1 99 65 0
130 2.42323e-009 3 0 9 2 2 -1 99 66 0 LO
131 1.11571e-008 3 0 9 9 9 -1 99 67 0 LO
132 -5.75388 3 -10 10 0 5 -1 99 68 0
SEL_parm_devs
1_YR1982 0
Forecast_Recr_Devs
2007 0 - - - - - 69

```

Selex\_Block\_Assignments Years:

Base_parm#	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
1	0	0	0	0	0	0	0	0	0	0	0	0	0	115	115	115	115	115	115	115	115	115	115	115	115
3	0	0	0	0	0	0	0	0	0	0	0	0	0	116	116	116	116	116	116	116	116	116	116	116	116
7	0	0	0	0	0	0	0	0	0	0	0	0	0	117	117	117	117	117	117	117	117	117	117	117	117
9	0	0	0	0	0	0	0	0	0	0	0	0	0	118	118	118	118	118	118	118	118	118	118	118	118
13	0	0	0	0	0	0	0	0	0	0	0	0	0	119	119	119	119	119	119	119	119	119	119	119	119
15	0	0	0	0	0	0	0	0	0	0	0	0	0	120	120	120	120	120	120	120	120	120	120	120	120
16	0	0	0	0	0	0	0	0	0	0	0	0	0	121	121	121	121	121	121	121	121	121	121	121	121
18	0	0	0	0	0	0	0	0	0	0	0	0	0	122	122	122	122	122	122	122	122	122	122	122	122
19	0	0	0	0	0	0	0	0	0	0	0	0	0	123	123	123	123	123	123	123	123	123	123	123	123
21	0	0	0	0	0	0	0	0	0	0	0	0	0	124	124	124	124	124	124	124	124	124	124	124	124
22	0	0	0	0	0	0	0	0	0	0	0	0	0	125	125	125	125	125	125	125	125	125	125	125	125
24	0	0	0	0	0	0	0	0	0	0	0	0	0	126	126	126	126	126	126	126	126	126	126	126	126
25	0	0	0	0	0	0	0	0	0	0	0	0	0	127	127	127	127	127	127	127	127	127	127	127	127





```

5 1995  2.89121 -3 0.491235 9 -999 -999
6 1982  1.60547 -9 2.23577e-008 1.65515e-007 -999 -9.99912
6 1995  1.55718 -9 2.42323e-009 1.11571e-008 -999 -5.75388
7 1982  1 1
8 1982  2 2
9 1982  3 3
10 1982  4 4
11 1982  5 15
12 1982  1 1
13 1982  2 2
14 1982  3 3
15 1982  4 4
16 1982  5 15
17 1982  0 0
18 1982  2 2
19 1982  3 3
20 1982  4 4
21 1982  2 2
22 1982  3 3
23 1982  3 3
24 1982  4 4
25 1982  2 2
26 1982  3 3
27 1982  4 4
28 1982  2 2
29 1982  3 3
30 1982  4 4
31 1982  5 15
32 1982  3 3
33 1982  4 4
34 1982  1 1
35 1982  2 15
36 1982  1 1
37 1982  2 2
38 1982  3 3
39 1982  4 15
40 1982  0 0
41 1982  0 0
42 1982  0 0
43 1982  0 0
44 1982  0 0
45 1982  4 15

```

```

EXPLOITATION  Hrate_is_Continuous_F  Fleet_in_columns;_year_in_rows
yr seas 1 2 3 4 5 6
init_yr 1  1.2679 0 0 0 0 0
1982 1  0.595402 0.345118 0 0 0.571907 0.0204952
1983 1  0.797626 0.388142 0 0 0.0801778 0.0228562
1984 1  0.725689 0.586247 0 0 0.463563 0.0221396
1985 1  0.802818 0.445766 0 0 0.36574 0.00568771
1986 1  0.818679 0.366873 0 0 0.584079 0.039284
1987 1  0.783304 0.309775 0 0 0.367215 0.0332012
1988 1  1.05521 0.439869 0 0 0.530945 0.0266954
1989 1  0.898225 0.404364 0.074797 0 0.196128 0.00626545
1990 1  0.496874 0.333209 0.113382 0 0.327412 0.0330574
1991 1  0.629675 0.36496 0.0842471 0 0.416467 0.0487067
1992 1  0.884227 0.260421 0.0553676 0 0.382673 0.038694

```

1993 1 0.580373 0.282546 0.0611891 0 0.436058 0.0925591  
1994 1 0.562156 0.296654 0.0296666 0.0509053 0.407506 0.0631812  
1995 1 0.760228 0.525156 0.0122314 0.0200129 0.426889 0.0613531  
1996 1 0.475522 0.3635 0.0235728 0.00913772 0.578351 0.042292  
1997 1 0.282129 0.0823618 0.0126451 0.00530796 0.513491 0.0292825  
1998 1 0.257561 0.118628 0.0118904 0.00748703 0.420086 0.0366528  
1999 1 0.197563 0.0910697 0.0471332 0.0177053 0.222714 0.0327238  
2000 1 0.173567 0.0918201 0.0219422 0.0059384 0.38613 0.0436747  
2001 1 0.175605 0.07105 0.00826828 0.0106197 0.261697 0.0594051  
2002 1 0.202588 0.0946733 0.0098913 0.00573971 0.161527 0.0339231  
2003 1 0.185697 0.072284 0.0129194 0.00301957 0.211607 0.0350385  
2004 1 0.213811 0.0898307 0.00474415 0.00254895 0.176707 0.0421661  
2005 1 0.204824 0.0716039 0.00425289 0.00274663 0.166086 0.0422069  
2006 1 0.145567 0.0671848 0.00589704 0.00257925 0.168439 0.0367256  
2007 1 9.23527e-006 4.26244e-006 3.74129e-007 1.63637e-007 1.06863e-005  
2.33e-006

TIME\_SERIES Bio-Smry\_age:\_1 Hrate\_is\_Continuous\_F  
pop year period season bio-all bio-smry SpawnBio recruit-0 enc\_catch:\_1  
dead\_catch:\_1 ret\_catch:\_1 obs\_cat:\_1 Hrate-1 enc\_catch:\_2 dead\_catch:\_2  
ret\_catch:\_2 obs\_cat:\_2 Hrate-2 enc\_catch:\_3 dead\_catch:\_3 ret\_catch:\_3  
obs\_cat:\_3 Hrate-3 enc\_catch:\_4 dead\_catch:\_4 ret\_catch:\_4 obs\_cat:\_4 Hrate-4  
enc\_catch:\_5 dead\_catch:\_5 ret\_catch:\_5 obs\_cat:\_5 Hrate-5 enc\_catch:\_6  
dead\_catch:\_6 ret\_catch:\_6 obs\_cat:\_6 Hrate-6 SPB\_vir\_LH  
1 1980 VIRG 1 479634 479226 477538 59911.2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
0 0 0 0 0 0 0 0 0 0 0 0 0 0 477569  
1 1981 INIT 1 23214.8 22960.1 22076.4 37379.9 16827 16827 16827 10000 1.2679  
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 22076.4  
1 1982 TIME 1 23283 22960.1 22076.4 47391.2 7418.04 7418.04 7418.04 7536  
0.595402 2824.76 2824.76 2824.76 2864 0.345118 0 0 0 0 0 0 0 0 8218.91  
8218.91 8218.91 8267 0.571907 296.063 296.063 296.063 296 0.0204952 22102.3  
1 1983 TIME 1 23541.5 23153.1 22000.4 56997.8 10632.9 10632.9 10632.9 10201  
0.797626 3215.63 3215.63 3215.63 3201 0.388142 0 0 0 0 0 0 0 0 1274.63  
1274.63 1274.63 1268 0.0801778 376.767 376.767 376.767 376 0.0228562 22148  
1 1984 TIME 1 30526.1 30259 28798.3 39199.6 11069.2 11069.2 11069.2 11455  
0.725689 5491.51 5491.51 5491.51 5674 0.586247 0 0 0 0 0 0 0 0 8340.76  
8340.76 8340.76 8512 0.463563 414.907 414.907 414.907 415 0.0221396 28899.8  
1 1985 TIME 1 25406.5 25081.3 24022.7 47705.8 10987 10987 10987 10767  
0.802818 3914.39 3914.39 3914.39 3907 0.445766 0 0 0 0 0 0 0 0 5732.58  
5732.58 5732.58 5665 0.36574 92.0256 92.0256 92.0256 92 0.00568771 24146.3  
1 1986 TIME 1 24542.7 24199.2 23023.6 50405.6 9670.04 9670.04 9670.04 9500  
0.818679 2702.9 2702.9 2702.9 2687 0.366873 0 0 0 0 0 0 0 0 8222.45  
8222.45 8222.45 8102 0.584079 578.55 578.55 578.55 578 0.039284 23154.1  
1 1987 TIME 1 23800.7 23557 22328.7 35763.9 9771.98 9771.98 9771.98 9945  
0.783304 2311.33 2311.33 2311.33 2326 0.309775 0 0 0 0 0 0 0 0 5474.22  
5474.22 5474.22 5519 0.367215 521.584 521.584 521.584 522 0.0332012 22421.3  
1 1988 TIME 1 23069.5 22995 22023.2 10933.3 11486.8 11486.8 11486.8 11616  
1.05521 3055.86 3055.86 3055.86 3071 0.439869 0 0 0 0 0 0 0 0 6593.9  
6593.9 6593.9 6634 0.530945 340.93 340.93 340.93 341 0.0266954 22051.5  
1 1989 TIME 1 11676 11512.9 11160.3 23928.4 5975.95 5975.95 5975.95 6218  
0.898225 1879.73 1879.73 1879.73 1908 0.404364 705.757 705.757 705.757 709  
0.074797 0 0 0 0 1421.61 1421.61 1421.61 1435 0.196128 44.9871 44.9871  
44.9871 45 0.00626545 11222.3  
1 1990 TIME 1 10639.2 10440.9 9899.27 29096.3 2804.32 2804.32 2804.32 2962  
0.496874 1201.59 1201.59 1201.59 1237 0.333209 1197.79 1197.79 1197.79 1214  
0.113382 0 0 0 0 2244.76 2244.76 2244.76 2329 0.327412 233.236 233.236  
233.236 234 0.0330574 9974.62

1 1991 TIME 1 13788.5 13607.8 12908.3 26507 4473.92 4473.92 4473.92 4629  
0.629675 1562.38 1562.38 1562.38 1595 0.36496 1046.58 1046.58 1046.58 1052  
0.0842471 0 0 0 0 3528.02 3528.02 3528.02 3611 0.416467 428.241 428.241  
428.241 429 0.0487067 12977  
1 1992 TIME 1 14108.7 13885.9 13228.7 32693.2 6382.46 6382.46 6382.46 6361  
0.884227 1169.98 1169.98 1169.98 1168 0.260421 690.092 690.092 690.092 690  
0.0553676 0 0 0 0 3248.25 3248.25 3248.25 3242 0.382673 344.367 344.367  
344.367 344 0.038694 13313.3  
1 1993 TIME 1 14919.9 14710.7 13934.8 30696.7 4491.49 4491.49 4491.49 4401  
0.580373 1322.18 1322.18 1322.18 1313 0.282546 846.301 846.301 846.301 846  
0.0611891 0 0 0 0 4055.18 4055.18 4055.18 4006 0.436058 909.333 909.333  
909.333 910 0.0925591 14014.3  
1 1994 TIME 1 16141.9 15947.6 15184 28514.4 4958.5 4958.5 4958.5 4969  
0.562156 1630.73 1630.73 1630.73 1620 0.296654 433.541 433.541 433.541 434  
0.0296666 472.132 472.132 472.132 472 0.0509053 4201.27 4201.27 4201.27 4231  
0.407506 677.4 677.4 677.4 678 0.0631812 15257.9  
1 1995 TIME 1 16363 16138.4 15414.2 32953.6 4447.27 4447.27 4447.27 4911  
0.760228 1943.54 1943.54 1943.54 2066 0.525156 137.847 137.847 137.847 138  
0.0122314 169.595 169.595 169.595 170 0.0200129 2324.56 2324.56 2324.56 2450  
0.426889 750.203 750.203 750.203 752 0.0613531 15499.6  
1 1996 TIME 1 20718.7 20552.7 19654.2 24358.2 3918.19 3918.19 3918.19 3947  
0.475522 1867.38 1867.38 1867.38 1913 0.3635 355.946 355.946 355.946 355  
0.0235728 108.07 108.07 108.07 108 0.00913772 4388.14 4388.14 4388.14 4454  
0.578351 687.134 687.134 687.134 681 0.042292 19717.3  
1 1997 TIME 1 23214.8 23032.1 22276.1 26808.5 3484.28 3484.28 3484.28 3313  
0.282129 687.09 687.09 687.09 681 0.0823618 239.71 239.71 239.71 239  
0.0126451 86.1085 86.1085 86.1085 86 0.00530796 5833.36 5833.36 5833.36 5382  
0.513491 559.913 559.913 559.913 556 0.0292825 22345.5  
1 1998 TIME 1 26576.2 26380.7 25618.9 28696.3 3850.77 3850.77 3850.77 3730  
0.257561 1366 1366 1366 1346 0.118628 254.276 254.276 254.276 254 0.0118904  
135.111 135.111 135.111 135 0.00748703 5958.31 5958.31 5958.31 5659 0.420086  
735.407 735.407 735.407 734 0.0366528 25693.2  
1 1999 TIME 1 29259.8 29109.1 28286.6 22114.6 3539.67 3539.67 3539.67 3551  
0.197563 1271.76 1271.76 1271.76 1271 0.0910697 1177.61 1177.61 1177.61 1181  
0.0471332 366.676 366.676 366.676 367 0.0177053 3785.77 3785.77 3785.77 3795  
0.222714 708.711 708.711 708.711 711 0.0327238 28343.9  
1 2000 TIME 1 32517.2 32332 31637.6 27166 3590 3590 3590 3564 0.173567  
1529.87 1529.87 1529.87 1521 0.0918201 591.85 591.85 591.85 592 0.0219422  
133.992 133.992 133.992 134 0.0059384 7604.64 7604.64 7604.64 7470 0.38613  
948.278 948.278 948.278 952 0.0436747 31708  
1 2001 TIME 1 32786.7 32601.2 31846.6 27215 3752.61 3752.61 3752.61 3705  
0.175605 1274.81 1274.81 1274.81 1265 0.07105 230.053 230.053 230.053 230  
0.00826828 238.013 238.013 238.013 238 0.0106197 5395.49 5395.49 5395.49 5279  
0.261697 1268.49 1268.49 1268.49 1274 0.0594051 31917  
1 2002 TIME 1 35532.8 35327.1 34532.3 30178.7 4845.25 4845.25 4845.25 4723  
0.202588 1871.1 1871.1 1871.1 1850 0.0946733 307.344 307.344 307.344 307  
0.0098913 142.064 142.064 142.064 142 0.00573971 3704.72 3704.72 3704.72 3632  
0.161527 776.721 776.721 776.721 777 0.0339231 34610.5  
1 2003 TIME 1 39940.8 39797.3 38930.3 21051.9 5006.81 5006.81 5006.81 4835  
0.185697 1635.26 1635.26 1635.26 1614 0.072284 446.213 446.213 446.213 445  
0.0129194 83.0403 83.0403 83.0403 83 0.00301957 5493.05 5493.05 5493.05 5279  
0.211607 885.684 885.684 885.684 882 0.0350385 38984.8  
1 2004 TIME 1 41141.6 40946.7 40257.4 28596.6 6255.46 6255.46 6255.46 6036  
0.213811 2221.22 2221.22 2221.22 2193 0.0898307 170.135 170.135 170.135 170  
0.00474415 74.0298 74.0298 74.0298 74 0.00254895 4968.13 4968.13 4968.13 4831  
0.176707 1038.15 1038.15 1038.15 1034 0.0421661 40331.4

1 2005 TIME 1 41755.1 41659.5 40874.8 14016.7 6009.79 6009.79 6009.79 5984  
 0.204824 1846.92 1846.92 1846.92 1841 0.0716039 152.99 152.99 152.99 153  
 0.00425289 76.9977 76.9977 76.9977 77 0.00274663 4745.78 4745.78 4745.78 4724  
 0.166086 996.952 996.952 996.952 999 0.0422069 40911.1  
 1 2006 TIME 1 40233.3 40053.2 39529 26414.8 4482.71 4482.71 4482.71 4481  
 0.145567 1781.85 1781.85 1781.85 1781 0.0671848 213.998 213.998 213.998 214  
 0.00589704 73.9991 73.9991 73.9991 74 0.00257925 4995.37 4995.37 4995.37 4992  
 0.168439 794.683 794.683 794.683 795 0.0367256 39597.5  
 1 2007 FORE 1 41381 41082.8 40510.7 43744.6 0.332017 0.332017 0.332017  
 0.332017 9.23527e-006 0.140433 0.140433 0.140433 0.140433 4.26244e-006  
 0.0157942 0.0157942 0.0157942 0.0157942 3.74129e-007 0.00517644 0.00517644  
 0.00517644 0.00517644 1.63637e-007 0.378088 0.378088 0.378088 0.378088  
 1.06863e-005 0.0564658 0.0564658 0.0564658 0.0564658 2.33e-006 40510.8

SPR\_series uses\_R0= 59911.2 ###note\_Y/R\_unit\_is\_Dead\_Biomass  
 Year Bio\_all Bio\_Smry SPBzero SPBfished SPBfished/R SPR Y/R GenTime Actual:  
 Bio\_all Bio\_Smry Enc\_Catch Dead\_Catch Retain\_Catch SPB Recruits Tot\_Exploit  
 More\_F(by\_morph): aveF-1 maxF-1  
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 23283 22960.1 18757.8 18757.8 18757.8 22076.4 47391.2 0.805642 + 1.44249  
 1.52969  
 1983 39727.3 39319 477538 37881.2 0.632289 0.0793261 0.461154 0.23543 +  
 23541.5 23153.1 15499.9 15499.9 15499.9 22000.4 56997.8 0.658408 + 1.19978  
 1.28519  
 1984 30604.9 30196.6 477538 28851.5 0.481571 0.0604172 0.422874 0.142576 +  
 30526.1 30259 25316.4 25316.4 25316.4 28798.3 39199.6 0.829334 + 1.68367  
 1.79396  
 1985 32604.1 32195.8 477538 30827 0.514545 0.064554 0.431829 0.167119 +  
 25406.5 25081.3 20726 20726 20726 24022.7 47705.8 0.815777 + 1.53083 1.6188  
 1986 28732.3 28324 477538 27010.1 0.450836 0.0565612 0.412432 0.143482 +  
 24542.7 24199.2 21173.9 21173.9 21173.9 23023.6 50405.6 0.862739 + 1.69089  
 1.80298  
 1987 33418.6 33010.3 477538 31640.1 0.528117 0.0662567 0.433782 0.194523 +  
 23800.7 23557 18079.1 18079.1 18079.1 22328.7 35763.9 0.759603 + 1.39378  
 1.48847  
 1988 27011.5 26603.2 477538 25306.4 0.422399 0.0529936 0.405091 0.11147 +  
 23069.5 22995 21477.5 21477.5 21477.5 22023.2 10933.3 0.930991 + 1.93015  
 2.04851  
 1989 32058.6 31650.3 477538 30312.3 0.505953 0.0634762 0.42636 0.187241 +  
 11676 11512.9 10028 10028 10028 11160.3 23928.4 0.858859 + 1.48977 1.57852  
 1990 34595 34186.7 477538 32858.3 0.54845 0.0688077 0.431163 0.261998 +  
 10639.2 10440.9 7681.7 7681.7 7681.7 9899.27 29096.3 0.722017 + 1.20894  
 1.29892  
 1991 30934.6 30526.3 477538 29218.7 0.487701 0.0611863 0.41836 0.204142 +  
 13788.5 13607.8 11039.1 11039.1 11039.1 12908.3 26507 0.800607 + 1.42673  
 1.53678  
 1992 30034.8 29626.5 477538 28314.4 0.472607 0.0592925 0.416204 0.182126 +  
 14108.7 13885.9 11835.1 11835.1 11835.1 13228.7 32693.2 0.838854 + 1.51252  
 1.61562  
 1993 31873.8 31465.5 477538 30146.8 0.503191 0.0631296 0.421973 0.227998 +  
 14919.9 14710.7 11624.5 11624.5 11624.5 13934.8 30696.7 0.779124 + 1.30933  
 1.43927  
 1994 33590.3 33182 477538 31831.6 0.531313 0.0666577 0.431053 0.235435 +  
 16141.9 15947.6 12373.6 12373.6 12373.6 15184 28514.4 0.766549 + 1.25185  
 1.39954

1995 45868.1 45459.8 477538 43913.8 0.732982 0.0919589 0.50213 0.147926 +  
 16363 16138.4 9773.01 9773.01 9773.01 15414.2 32953.6 0.597262 + 1.58823  
 1.78146  
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 20718.7 20552.7 11324.9 11324.9 11324.9 19654.2 24358.2 0.546602 + 1.32259  
 1.47529  
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 0.917455  
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 26576.2 26380.7 12299.9 12299.9 12299.9 25618.9 28696.3 0.462815 + 0.747176  
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 0.49981  
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 0.51235  
 2004 97930.7 97522.4 477538 95913.4 1.60093 0.20085 0.573505 0.506709 +  
 41141.6 40946.7 14727.1 14727.1 14727.1 40257.4 28596.6 0.357962 + 0.450859  
 0.519928  
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 0.482293  
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 40053.2 12342.6 12342.6 12342.6 39529 26414.8 0.306776 + 0.360707 0.418063  
 2007 479522 479114 477538 477457 7.96942 0.999831 0.000185743 0.818711 +  
 41381 41082.8 0.927974 0.927974 0.927974 40510.7 43744.6 2.24251e-005 +  
 2.28845e-005 2.65233e-005

SPAWN\_RECRUIT Function: 3 - - - - -  
 11.0006 Ln(R0) 59911.2  
 0.879485 steep  
 0.6 stddev\_recr  
 0 env\_link\_  
 -0.47173 init-eq 37379.9  
 1982 2006 recdev:start\_end 1957 first\_year\_with\_full\_bias\_adjustment  
 year spawn\_bio exp\_recr with-env bias-adj pred\_recr dev  
 S/Rcurve 477538 59911.2  
 Virg 477538 59911.2 59911.2 50042 59911.2  
 Init 22076.4 37379.9 37379.9 31222.3 37379.9  
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 2004 40257.4 43663.6 43663.6 36470.9 28596.6 -0.243228  
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 2007 40510.7 43744.6 43744.6 43744.6 43744.6 0 forecast

N\_est r.m.s.e.  
 25 0.419648

INDEX\_2

index	year	vuln	bio	obs	exp	eff_Q	SE	Dev	Like	Like+log(s)
7	1982	29774.9	-0.001	5.02351	0.000168716	0.16				
7	1983	37028.8	-0.001	6.24736	0.000168716	0.16				
7	1984	45427.8	-0.001	7.66442	0.000168716	0.16				
7	1985	30632.9	-0.001	5.16827	0.000168716	0.16				
7	1986	37501	-0.001	6.32702	0.000168716	0.16				
7	1987	39105.7	-0.001	6.59778	0.000168716	0.16				
7	1988	28102.3	-0.001	4.74131	0.000168716	0.16				
7	1989	8463.62	-0.001	1.42795	0.000168716	0.16				
7	1990	18452.8	-0.001	3.11328	0.000168716	0.16				
7	1991	22155	-0.001	3.73791	0.000168716	0.16				
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7	1993	25126.3	6.5	4.23921	0.000168716	0.16	0.427426	3.56822	1.73564	
7	1994	23534.2	3.76	3.9706	0.000168716	0.16	-0.0544976	0.0580076	-1.77457	
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7	1997	19737.2	3.86	3.32998	0.000168716	0.16	0.147701	0.426084	-1.4065	
7	1998	21788.8	1.68	3.67613	0.000168716	0.16	-0.783067	11.9764	10.1439	
7	1999	23322.2	2.11	3.93483	0.000168716	0.16	-0.623181	7.58505	5.75246	
7	2000	17962.7	0.7	3.0306	0.000168716	0.16	-1.46544	41.9435	40.1109	
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7	2002	22104.7	2.77	3.72943	0.000168716	0.16	-0.297407	1.72756	-0.105022	
7	2003	24578.6	8.17	4.1468	0.000168716	0.16	0.678131	8.98168	7.1491	
7	2004	17137	1.45	2.89128	0.000168716	0.16	-0.690137	9.30253	7.46995	
7	2005	23278.6	2.96	3.92748	0.000168716	0.16	-0.282808	1.56212	-0.270462	
7	2006	11411.5	2.64	1.92531	0.000168716	0.16	0.315691	1.9465	0.113919	
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8	1983	12864.2	-0.001	5.87992	0.000457075	0.16				
8	1984	19555.4	-0.001	8.93827	0.000457075	0.16				
8	1985	19150.8	-0.001	8.75337	0.000457075	0.16				
8	1986	13693.6	-0.001	6.25902	0.000457075	0.16				
8	1987	14476.6	-0.001	6.61691	0.000457075	0.16				
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 28 1984 19555.4 -0.001 0.95346 4.8757e-005 0.4  
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 28 1995 10504.7 0.3 0.512179 4.8757e-005 0.4 -0.534892 0.894091 -0.0222001



28 1996 14786.3 0.384 0.720933 4.8757e-005 0.4 -0.629904 1.23994 0.323645  
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45 2004 8235.4 0.1 0.152899 1.85661e-005 0.4 -0.42461 0.563418 -0.352873  
45 2005 8883.53 0.04 0.164933 1.85661e-005 0.4 -1.41666 6.27162 5.35533  
45 2006 10069.7 0.04 0.186955 1.85661e-005 0.4 -1.54199 7.43039 6.5141

INDEX\_1

Index Do\_Power Power Do\_Env\_var Env\_Link Do\_ExtraVar Qtype Q Num=0/Bio=1  
Err\_type N Npos r.m.s.e. mean\_input\_SE mean\_(Input+extra)\_SE pen\_mean\_Qdev  
rmse\_Qdev



```

1 0 1.0 0 0.00 0.0 0 -- 1 0 0 0 0 0 0 0 0
2 0 1.0 0 0.00 0.0 0 -- 1 0 0 0 0 0 0 0 0
3 0 1.0 0 0.00 0.0 0 -- 1 0 0 0 0 0 0 0 0
4 0 1.0 0 0.00 0.0 0 -- 1 0 0 0 0 0 0 0 0
5 0 1.0 0 0.00 0.0 0 -- 1 0 0 0 0 0 0 0 0
6 0 1.0 0 0.00 0.0 0 -- 1 0 0 0 0 0 0 0 0
7 0 1.0 0 0.00 0.0 0 0.000168716 0 0 25 15 0.726836 0.16 0.16 0 0
8 0 1.0 0 0.00 0.0 0 0.000457075 0 0 25 15 0.387631 0.16 0.16 0 0
9 0 1.0 0 0.00 0.0 0 0.00035905 0 0 25 15 0.600424 0.16 0.16 0 0
10 0 1.0 0 0.00 0.0 0 0.000380449 0 0 25 15 0.700198 0.16 0.16 0 0
11 0 1.0 0 0.00 0.0 0 0.000549826 0 0 25 14 0.540455 0.16 0.16 0 0
12 0 1.0 0 0.00 0.0 0 1.64656e-005 0 0 25 25 0.671465 0.21 0.21 0 0
13 0 1.0 0 0.00 0.0 0 4.16651e-005 0 0 25 25 0.540143 0.21 0.21 0 0
14 0 1.0 0 0.00 0.0 0 3.43403e-005 0 0 25 24 0.802098 0.21 0.21 0 0
15 0 1.0 0 0.00 0.0 0 4.35677e-005 0 0 25 20 0.425565 0.21 0.21 0 0
16 0 1.0 0 0.00 0.0 0 7.78219e-005 0 0 25 15 0.443304 0.21 0.21 0 0
17 0 1.0 0 0.00 0.0 0 9.55652e-006 0 0 25 25 0.721548 0.31 0.31 0 0
18 0 1.0 0 0.00 0.0 0 7.38611e-005 0 0 25 25 0.447087 0.31 0.31 0 0
19 0 1.0 0 0.00 0.0 0 9.18233e-005 0 0 25 25 0.750706 0.31 0.31 0 0
20 0 1.0 0 0.00 0.0 0 0.000101415 0 0 25 23 0.634852 0.31 0.31 0 0
21 0 1.0 0 0.00 0.0 0 4.51905e-005 0 0 25 25 0.949882 0.21 0.21 0 0
22 0 1.0 0 0.00 0.0 0 4.50405e-005 0 0 25 25 0.798611 0.21 0.21 0 0
23 0 1.0 0 0.00 0.0 0 0.000129624 0 0 25 24 1.3806 0.21 0.21 0 0
24 0 1.0 0 0.00 0.0 0 0.000762365 0 0 25 24 0.843931 0.21 0.21 0 0
25 0 1.0 0 0.00 0.0 0 1.91489e-005 0 0 25 23 0.776215 0.4 0.4 0 0
26 0 1.0 0 0.00 0.0 0 1.94099e-005 0 0 25 23 0.751543 0.4 0.4 0 0
27 0 1.0 0 0.00 0.0 0 3.3982e-005 0 0 25 22 0.779091 0.4 0.4 0 0
28 0 1.0 0 0.00 0.0 0 4.8757e-005 0 0 25 22 0.723892 0.4 0.4 0 0
29 0 1.0 0 0.00 0.0 0 0.000118143 0 0 25 22 0.539206 0.4 0.4 0 0
30 0 1.0 0 0.00 0.0 0 0.000104706 0 0 25 22 0.450363 0.4 0.4 0 0
31 0 1.0 0 0.00 0.0 0 8.15984e-005 0 0 25 22 0.781246 0.4 0.4 0 0
32 0 1.0 0 0.00 0.0 0 0.000118627 0 0 25 25 0.727804 0.4 0.4 0 0
33 0 1.0 0 0.00 0.0 0 9.96826e-005 0 0 25 20 0.848556 0.4 0.4 0 0
34 0 1.0 0 0.00 0.0 0 1.20886e-005 0 0 25 17 0.887564 0.4 0.4 0 0
35 0 1.0 0 0.00 0.0 0 1.96985e-005 0 0 25 17 0.89471 0.4 0.4 0 0
36 0 1.0 0 0.00 0.0 0 0.000183527 0 0 25 19 0.644042 0.4 0.4 0 0
37 0 1.0 0 0.00 0.0 0 7.58042e-005 0 0 25 19 1.00817 0.4 0.4 0 0
38 0 1.0 0 0.00 0.0 0 4.52769e-005 0 0 25 16 0.850349 0.4 0.4 0 0
39 0 1.0 0 0.00 0.0 0 6.54363e-005 0 0 25 15 0.794374 0.4 0.4 0 0
40 0 1.0 0 0.00 0.0 0 2.10772e-006 0 0 25 19 0.9498 0.4 0.4 0 0
41 0 1.0 0 0.00 0.0 0 3.29307e-005 0 0 25 25 0.565655 0.4 0.4 0 0
42 0 1.0 0 0.00 0.0 0 4.53013e-005 0 0 25 19 0.624686 0.4 0.4 0 0
43 0 1.0 0 0.00 0.0 0 0.000278888 0 0 25 25 0.590551 0.4 0.4 0 0
44 0 1.0 0 0.00 0.0 0 6.30965e-006 0 0 25 21 0.867523 0.4 0.4 0 0
45 0 1.0 0 0.00 0.0 0 1.85661e-005 0 0 25 15 1.16869 0.4 0.4 0 0

```

rmse\_Qdev\_not\_in\_logL  
pen\_mean\_Qdev\_not\_in\_logL\_in\_randwalk\_approach

INDEX\_3

Index Q\_parm\_assignments

```

1 0 -- 0 -- 0 0
2 0 -- 0 -- 0 0
3 0 -- 0 -- 0 0
4 0 -- 0 -- 0 0
5 0 -- 0 -- 0 0
6 0 -- 0 -- 0 0
7 0 -- 0 -- 0 0

```

```

8 0 -- 0 -- 0 0
9 0 -- 0 -- 0 0
10 0 -- 0 -- 0 0
11 0 -- 0 -- 0 0
12 0 -- 0 -- 0 0
13 0 -- 0 -- 0 0
14 0 -- 0 -- 0 0
15 0 -- 0 -- 0 0
16 0 -- 0 -- 0 0
17 0 -- 0 -- 0 0
18 0 -- 0 -- 0 0
19 0 -- 0 -- 0 0
20 0 -- 0 -- 0 0
21 0 -- 0 -- 0 0
22 0 -- 0 -- 0 0
23 0 -- 0 -- 0 0
24 0 -- 0 -- 0 0
25 0 -- 0 -- 0 0
26 0 -- 0 -- 0 0
27 0 -- 0 -- 0 0
28 0 -- 0 -- 0 0
29 0 -- 0 -- 0 0
30 0 -- 0 -- 0 0
31 0 -- 0 -- 0 0
32 0 -- 0 -- 0 0
33 0 -- 0 -- 0 0
34 0 -- 0 -- 0 0
35 0 -- 0 -- 0 0
36 0 -- 0 -- 0 0
37 0 -- 0 -- 0 0
38 0 -- 0 -- 0 0
39 0 -- 0 -- 0 0
40 0 -- 0 -- 0 0
41 0 -- 0 -- 0 0
42 0 -- 0 -- 0 0
43 0 -- 0 -- 0 0
44 0 -- 0 -- 0 0
45 0 -- 0 -- 0 0

```

```

DISCARD log(L)_based_on_T-distribution_with_DF=_30
as_fraction
index year seas obs exp cv Dev Like Like+log(s)

```

```

MEAN_BODY_WT log(L)_based_on_T-distribution_with_DF=_30
year seas index Mkt obs exp cv Dev Like Like+log(s)
1982 1 1 0 0.504 0.668148 0.1 -0.164148 4.69267 4.69267
1983 1 1 0 0.521 0.626652 0.1 -0.105652 1.99113 1.99113
1984 1 1 0 0.518 0.628874 0.1 -0.110874 2.20286 2.20286
1985 1 1 0 0.575 0.660544 0.1 -0.0855437 1.10332 1.10332
1986 1 1 0 0.613 0.620202 0.1 -0.007202 0.0071301 0.0071301
1987 1 1 0 0.581 0.615069 0.1 -0.0340691 0.176646 0.176646
1988 1 1 0 0.588 0.66533 0.1 -0.0773298 0.868804 0.868804
1989 1 1 0 0.668 0.734795 0.1 -0.0667948 0.508164 0.508164
1990 1 1 0 0.54 0.622326 0.1 -0.0823259 1.15662 1.15662
1991 1 1 0 0.537 0.618015 0.1 -0.0810151 1.13349 1.13349
1992 1 1 0 0.595 0.629482 0.1 -0.0344819 0.17256 0.17256

```

1993	1	1	0	0.571	0.612088	0.1	-0.0410875	0.265239	0.265239
1994	1	1	0	0.605	0.641615	0.1	-0.0366146	0.188092	0.188092
1995	1	1	0	0.675	0.778673	0.1	-0.103673	1.17327	1.17327
1996	1	1	0	0.621	0.788782	0.1	-0.167782	3.37572	3.37572
1997	1	1	0	0.697	0.866739	0.1	-0.169739	2.79607	2.79607
1998	1	1	0	0.759	0.959393	0.1	-0.200393	3.23841	3.23841
1999	1	1	0	0.755	1.00132	0.1	-0.246317	4.70655	4.70655
2000	1	1	0	0.85	1.0595	0.1	-0.209497	2.85806	2.85806
2001	1	1	0	0.903	1.11397	0.1	-0.21097	2.59103	2.59103
2002	1	1	0	0.898	1.12294	0.1	-0.224944	2.94383	2.94383
2003	1	1	0	0.999	1.14422	0.1	-0.145224	1.0551	1.0551
2004	1	1	0	0.983	1.17684	0.1	-0.193843	1.88916	1.88916
2005	1	1	0	0.949	1.23621	0.1	-0.28721	4.12987	4.12987
2006	1	1	0	0.947	1.25562	0.1	-0.308624	4.69781	4.69781

FIT\_LEN\_COMPS

Index Year Seas Gender Mkt Nsamp effN Like

index N Npos mean\_effN mean(inputN) HarMean(effN) Mean(effN/inputN)

MeaneffN/MeaninputN

1	0	0	0	0	0	0	-1.	#IND
2	0	0	0	0	0	0	-1.	#IND
3	0	0	0	0	0	0	-1.	#IND
4	0	0	0	0	0	0	-1.	#IND
5	0	0	0	0	0	0	-1.	#IND
6	0	0	0	0	0	0	-1.	#IND
7	0	0	0	0	0	0	-1.	#IND
8	0	0	0	0	0	0	-1.	#IND
9	0	0	0	0	0	0	-1.	#IND
10	0	0	0	0	0	0	-1.	#IND
11	0	0	0	0	0	0	-1.	#IND
12	0	0	0	0	0	0	-1.	#IND
13	0	0	0	0	0	0	-1.	#IND
14	0	0	0	0	0	0	-1.	#IND
15	0	0	0	0	0	0	-1.	#IND
16	0	0	0	0	0	0	-1.	#IND
17	0	0	0	0	0	0	-1.	#IND
18	0	0	0	0	0	0	-1.	#IND
19	0	0	0	0	0	0	-1.	#IND
20	0	0	0	0	0	0	-1.	#IND
21	0	0	0	0	0	0	-1.	#IND
22	0	0	0	0	0	0	-1.	#IND
23	0	0	0	0	0	0	-1.	#IND
24	0	0	0	0	0	0	-1.	#IND
25	0	0	0	0	0	0	-1.	#IND
26	0	0	0	0	0	0	-1.	#IND
27	0	0	0	0	0	0	-1.	#IND
28	0	0	0	0	0	0	-1.	#IND
29	0	0	0	0	0	0	-1.	#IND
30	0	0	0	0	0	0	-1.	#IND
31	0	0	0	0	0	0	-1.	#IND
32	0	0	0	0	0	0	-1.	#IND
33	0	0	0	0	0	0	-1.	#IND
34	0	0	0	0	0	0	-1.	#IND
35	0	0	0	0	0	0	-1.	#IND
36	0	0	0	0	0	0	-1.	#IND
37	0	0	0	0	0	0	-1.	#IND

38 0 0 0 0 0 0 -1.#IND  
 39 0 0 0 0 0 0 -1.#IND  
 40 0 0 0 0 0 0 -1.#IND  
 41 0 0 0 0 0 0 -1.#IND  
 42 0 0 0 0 0 0 -1.#IND  
 43 0 0 0 0 0 0 -1.#IND  
 44 0 0 0 0 0 0 -1.#IND  
 45 0 0 0 0 0 0 -1.#IND

FIT\_AGE\_COMPS

Index	Year	Seas	Gender	Mkt	Ageerr	Lbin_lo	Lbin_hi	Nsamp	effN	Like
1	1982	1	0	0	1	70	200	85.5962	14.025	
1	1983	1	0	0	1	70	200	26.1453	13.0996	
1	1984	1	0	0	1	70	200	133.911	5.50875	
1	1985	1	0	0	1	70	200	33.9569	6.19296	
1	1986	1	0	0	1	70	200	25.6884	11.1813	
1	1987	1	0	0	1	70	200	64.0426	4.45075	
1	1988	1	0	0	1	70	200	391.169	1.00861	
1	1989	1	0	0	1	70	200	188.124	5.60619	
1	1990	1	0	0	1	70	200	5499.35	0.299641	
1	1991	1	0	0	1	70	200	37.2816	4.88925	
1	1992	1	0	0	1	70	200	51.0219	9.6492	
1	1993	1	0	0	1	70	200	113.471	7.3935	
1	1994	1	0	0	1	70	200	75.8358	5.48157	
1	1995	1	0	0	1	70	200	33.9511	14.275	
1	1996	1	0	0	1	70	200	178.242	1.7418	
1	1997	1	0	0	1	70	200	32.2032	13.0573	
1	1998	1	0	0	1	70	200	19.8389	16.8555	
1	1999	1	0	0	1	70	200	21.028	18.9475	
1	2000	1	0	0	1	70	200	262.942	3.29927	
1	2001	1	0	0	1	70	200	67.0289	7.62395	
1	2002	1	0	0	1	70	200	44.392	9.70218	
1	2003	1	0	0	1	70	200	504.291	0.654478	
1	2004	1	0	0	1	70	200	523.512	1.22491	
1	2005	1	0	0	1	70	200	52.7312	11.973	
1	2006	1	0	0	1	70	200	111.249	5.66215	
2	1982	1	0	0	1	70	200	3.2155	87.9874	
2	1983	1	0	0	1	70	200	7.69229	28.6859	
2	1984	1	0	0	1	70	200	16.8473	18.5468	
2	1985	1	0	0	1	70	200	24.9299	12.3543	
2	1986	1	0	0	1	70	200	44.6751	7.17721	
2	1987	1	0	0	1	70	200	11.4841	16.7364	
2	1988	1	0	0	1	70	200	11.1	16.6407	
2	1989	1	0	0	1	70	200	15.0216	43.1886	
2	1990	1	0	0	1	70	200	4.39189	65.5082	
2	1991	1	0	0	1	70	200	5.1863	43.9718	
2	1992	1	0	0	1	70	200	2.73009	120.515	
2	1993	1	0	0	1	70	200	11.7554	13.1534	
2	1994	1	0	0	1	70	200	8.98554	38.1626	
2	1995	1	0	0	1	70	200	18.6101	28.6916	
2	1996	1	0	0	1	70	200	116.196	5.05878	
2	1997	1	0	0	1	70	200	69.6961	9.96949	
2	1998	1	0	0	1	70	200	3.33437	101.297	
2	1999	1	0	0	1	70	200	109.153	5.6251	
2	2000	1	0	0	1	70	200	21.3498	12.6869	
2	2001	1	0	0	1	70	200	137.66	3.98905	
2	2002	1	0	0	1	70	200	31.1826	13.3849	

2	2003	1	0	0	1	1	70	200	47.7808	9.43524
2	2004	1	0	0	1	1	70	200	203.914	5.95839
2	2005	1	0	0	1	1	70	200	143.113	8.73135
2	2006	1	0	0	1	1	70	200	102.072	5.38706
3	1989	1	0	0	1	1	70	200	3.39032	67.923
3	1990	1	0	0	1	1	70	200	19.879	18.2939
3	1991	1	0	0	1	1	70	200	23.7236	4.52891
3	1992	1	0	0	1	1	70	200	20.9349	26.9069
3	1993	1	0	0	1	1	70	200	62.9937	10.1992
3	1994	1	0	0	1	1	70	200	20.5232	16.1428
3	1995	1	0	0	1	1	70	200	8.50147	45.4147
3	1996	1	0	0	1	1	70	200	26.666	7.16717
3	1997	1	0	0	1	1	70	200	56.2516	6.40447
3	1998	1	0	0	1	1	70	200	221.885	1.05238
3	1999	1	0	0	1	1	70	200	27.3615	10.8778
3	2000	1	0	0	1	1	70	200	20.7523	13.7644
3	2001	1	0	0	1	1	70	200	19.7941	11.1505
3	2002	1	0	0	1	1	70	200	181.804	1.57122
3	2003	1	0	0	1	1	70	200	27.8547	17.5728
3	2004	1	0	0	1	1	70	200	71.6639	12.3121
3	2005	1	0	0	1	1	70	200	66.1211	11.051
3	2006	1	0	0	1	1	70	200	180.984	4.06168
4	1994	1	0	0	1	1	70	200	638.475	1.1315
4	1995	1	0	0	1	1	70	200	77.7338	1.76882
4	1996	1	0	0	1	1	70	200	2.84552	50.0014
4	1997	1	0	0	1	1	70	200	297.865	0.505193
4	1998	1	0	0	1	1	70	200	258.661	1.23921
4	1999	1	0	0	1	1	70	200	29.6692	9.72657
4	2000	1	0	0	1	1	70	200	65.9083	3.89138
4	2001	1	0	0	1	1	70	200	3.84953	50.1485
4	2002	1	0	0	1	1	70	200	202.23	1.55839
4	2003	1	0	0	1	1	70	200	15.7215	21.5337
4	2004	1	0	0	1	1	70	200	34.2735	6.79522
4	2005	1	0	0	1	1	70	200	15.8739	18.714
4	2006	1	0	0	1	1	70	200	30.2853	8.18038
5	1982	1	0	0	1	1	70	200	48.3589	9.62965
5	1983	1	0	0	1	1	70	200	250.157	3.62324
5	1984	1	0	0	1	1	70	200	46.83	7.80377
5	1985	1	0	0	1	1	70	200	116.517	2.23335
5	1986	1	0	0	1	1	70	200	149.92	2.88078
5	1987	1	0	0	1	1	70	200	330.738	3.10571
5	1988	1	0	0	1	1	70	200	666.122	1.56134
5	1989	1	0	0	1	1	70	200	45.2825	7.95809
5	1990	1	0	0	1	1	70	200	44.1238	6.8415
5	1991	1	0	0	1	1	70	200	35.7258	14.1112
5	1992	1	0	0	1	1	70	200	34.4845	17.0771
5	1993	1	0	0	1	1	70	200	27.7446	17.8874
5	1994	1	0	0	1	1	70	200	99.9562	4.46895
5	1995	1	0	0	1	1	70	200	15.9265	23.2424
5	1996	1	0	0	1	1	70	200	17.1425	15.3602
5	1997	1	0	0	1	1	70	200	689.564	4.04878
5	1998	1	0	0	1	1	70	200	151.818	2.29388
5	1999	1	0	0	1	1	70	200	32.2345	13.7254
5	2000	1	0	0	1	1	70	200	48.5339	7.31867
5	2001	1	0	0	1	1	70	200	165.315	5.62052
5	2002	1	0	0	1	1	70	200	42.7792	14.0773
5	2003	1	0	0	1	1	70	200	61.7343	10.3821

5 2004 1 0 0 1 1 70 200 83.745 5.19756  
 5 2005 1 0 0 1 1 70 200 125.907 5.95796  
 5 2006 1 0 0 1 1 70 200 91.1327 6.79342  
 6 1982 1 0 0 1 1 70 200 16.2957 5.28759  
 6 1983 1 0 0 1 1 70 200 121.317 0.774207  
 6 1984 1 0 0 1 1 70 200 9.59361 8.15871  
 6 1985 1 0 0 1 1 70 200 57.4429 1.58826  
 6 1986 1 0 0 1 1 70 200 283.219 0.369361  
 6 1987 1 0 0 1 1 70 200 2393.54 0.0419934  
 6 1988 1 0 0 1 1 70 200 24.1662 3.21648  
 6 1989 1 0 0 1 1 70 200 712.881 0.143492  
 6 1990 1 0 0 1 1 70 200 121.993 0.87565  
 6 1991 1 0 0 1 1 70 200 13.0387 10.8678  
 6 1992 1 0 0 1 1 70 200 9.09792 15.8942  
 6 1993 1 0 0 1 1 70 200 11.1399 13.218  
 6 1994 1 0 0 1 1 70 200 17.8505 4.7398  
 6 1995 1 0 0 1 1 70 200 247.644 0.384823  
 6 1996 1 0 0 1 1 70 200 65.1631 1.81403  
 6 1997 1 0 0 1 1 70 200 16.999 20.0448  
 6 1998 1 0 0 1 1 70 200 10.7803 15.2979  
 6 1999 1 0 0 1 1 70 200 11.639 15.3547  
 6 2000 1 0 0 1 1 70 200 11.5304 14.068  
 6 2001 1 0 0 1 1 70 200 92.9386 3.5525  
 6 2002 1 0 0 1 1 70 200 376.639 0.885492  
 6 2003 1 0 0 1 1 70 200 166.154 2.43347  
 6 2004 1 0 0 1 1 70 200 207.175 2.16058  
 6 2005 1 0 0 1 1 70 200 28.541 22.5628  
 6 2006 1 0 0 1 1 70 200 57.4543 14.5728

index N Npos mean\_effN mean(inputN) HarMean(effN) Mean(effN/inputN)  
 MeaneffN/MeaninputN

1 0 25 343.08 200 54.9403 1.7154 1.7154  
 2 0 25 46.883 200 10.8494 0.234415 0.234415  
 3 0 18 58.9492 200 20.2599 0.294746 0.294746  
 4 0 13 128.722 200 14.849 0.643612 0.643612  
 5 0 25 136.872 200 53.0946 0.684359 0.684359  
 6 0 25 203.369 200 25.0275 1.01685 1.01685  
 7 0 0 0 0 0 0 -1.#IND  
 8 0 0 0 0 0 0 -1.#IND  
 9 0 0 0 0 0 0 -1.#IND  
 10 0 0 0 0 0 0 -1.#IND  
 11 0 0 0 0 0 0 -1.#IND  
 12 0 0 0 0 0 0 -1.#IND  
 13 0 0 0 0 0 0 -1.#IND  
 14 0 0 0 0 0 0 -1.#IND  
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 16 0 0 0 0 0 0 -1.#IND  
 17 0 0 0 0 0 0 -1.#IND  
 18 0 0 0 0 0 0 -1.#IND  
 19 0 0 0 0 0 0 -1.#IND  
 20 0 0 0 0 0 0 -1.#IND  
 21 0 0 0 0 0 0 -1.#IND  
 22 0 0 0 0 0 0 -1.#IND  
 23 0 0 0 0 0 0 -1.#IND  
 24 0 0 0 0 0 0 -1.#IND  
 25 0 0 0 0 0 0 -1.#IND  
 26 0 0 0 0 0 0 -1.#IND

















1 1994 1 1994-1 0.021663 0.399745 0.999448 0.999976 0.99997 0.99973 0.999242  
0.998508 0.997528 0.996303 0.994834 0.993122 0.991168 0.988974 0.986541  
0.983872  
1 1995 1 1995-1 0.00253893 0.102677 0.720443 0.999541 0.999993 0.999909  
0.999575 0.998994 0.998168 0.997095 0.995778 0.994218 0.992414 0.99037  
0.988086 0.985564  
1 2006 1 2006-1 0.00253893 0.102677 0.720443 0.999541 0.999993 0.999909  
0.999575 0.998994 0.998168 0.997095 0.995778 0.994218 0.992414 0.99037  
0.988086 0.985564  
1 2007 1 2007-1 0.00253893 0.102677 0.720443 0.999541 0.999993 0.999909  
0.999575 0.998994 0.998168 0.997095 0.995778 0.994218 0.992414 0.99037  
0.988086 0.985564  
2 1982 1 1982-2 0.00985151 0.145692 0.675532 0.999153 0.999989 0.999946  
0.999662 0.999131 0.998353 0.99733 0.996062 0.99455 0.992795 0.990799  
0.988563 0.986088  
2 1994 1 1994-2 0.00985151 0.145692 0.675532 0.999153 0.999989 0.999946  
0.999662 0.999131 0.998353 0.99733 0.996062 0.99455 0.992795 0.990799  
0.988563 0.986088  
2 1995 1 1995-2 0.00106144 0.0394312 0.383279 0.9755 0.999953 0.999987  
0.999791 0.999348 0.998658 0.997722 0.996541 0.995116 0.993447 0.991537  
0.989386 0.986996  
2 2006 1 2006-2 0.00106144 0.0394312 0.383279 0.9755 0.999953 0.999987  
0.999791 0.999348 0.998658 0.997722 0.996541 0.995116 0.993447 0.991537  
0.989386 0.986996  
2 2007 1 2007-2 0.00106144 0.0394312 0.383279 0.9755 0.999953 0.999987  
0.999791 0.999348 0.998658 0.997722 0.996541 0.995116 0.993447 0.991537  
0.989386 0.986996  
3 1982 1 1982-3 0.347973 0.999523 0.999966 0.999996 0.999997 0.999998  
0.999998 0.999998 0.999998 0.999998 0.999997 0.999996 0.999991 0.999959  
0.997971 0.000471197  
3 1994 1 1994-3 0.347973 0.999523 0.999966 0.999996 0.999997 0.999998  
0.999998 0.999998 0.999998 0.999998 0.999997 0.999996 0.999991 0.999959  
0.997971 0.000471197  
3 1995 1 1995-3 0.0618538 0.568734 0.998788 0.999986 0.999999 1 1 1 1 1 1 1 1  
1 1 0.999769  
3 2006 1 2006-3 0.0618538 0.568734 0.998788 0.999986 0.999999 1 1 1 1 1 1 1 1  
1 1 0.999769  
3 2007 1 2007-3 0.0618538 0.568734 0.998788 0.999986 0.999999 1 1 1 1 1 1 1 1  
1 1 0.999769  
4 1982 1 1982-4 0.034365 0.497215 0.998452 0.97541 0.258896 0.00935664  
9.09988e-005 4.55558e-005 4.54797e-005 4.54604e-005 4.54507e-005 4.5445e-005  
4.54415e-005 4.54391e-005 4.54374e-005 4.54362e-005  
4 1994 1 1994-4 0.034365 0.497215 0.998452 0.97541 0.258896 0.00935664  
9.09988e-005 4.55558e-005 4.54797e-005 4.54604e-005 4.54507e-005 4.5445e-005  
4.54415e-005 4.54391e-005 4.54374e-005 4.54362e-005  
4 1995 1 1995-4 0.0107409 0.279376 0.984951 0.999189 0.735157 0.515702  
0.500663 0.500531 0.500531 0.500531 0.500531 0.500531 0.500531 0.500531  
0.500531 0.500531  
4 2006 1 2006-4 0.0107409 0.279376 0.984951 0.999189 0.735157 0.515702  
0.500663 0.500531 0.500531 0.500531 0.500531 0.500531 0.500531 0.500531  
0.500531 0.500531  
4 2007 1 2007-4 0.0107409 0.279376 0.984951 0.999189 0.735157 0.515702  
0.500663 0.500531 0.500531 0.500531 0.500531 0.500531 0.500531 0.500531  
0.500531 0.500531  
5 1982 1 1982-5 0.0505048 0.588763 0.999024 0.999989 0.999939 0.999644  
0.999103 0.998314 0.997281 0.996002 0.99448 0.992715 0.990709 0.988462  
0.985978 0.983256

5 1994 1 1994-5 0.0505048 0.588763 0.999024 0.999989 0.999939 0.999644  
0.999103 0.998314 0.997281 0.996002 0.99448 0.992715 0.990709 0.988462  
0.985978 0.983256  
5 1995 1 1995-5 0.00600833 0.112092 0.615127 0.999111 0.999986 0.999956  
0.999688 0.999173 0.998412 0.997404 0.996152 0.994656 0.992918 0.990937  
0.988717 0.986258  
5 2006 1 2006-5 0.00600833 0.112092 0.615127 0.999111 0.999986 0.999956  
0.999688 0.999173 0.998412 0.997404 0.996152 0.994656 0.992918 0.990937  
0.988717 0.986258  
5 2007 1 2007-5 0.00600833 0.112092 0.615127 0.999111 0.999986 0.999956  
0.999688 0.999173 0.998412 0.997404 0.996152 0.994656 0.992918 0.990937  
0.988717 0.986258  
6 1982 1 1982-6 0.0759641 0.69325 0.999338 0.857383 0.14368 0.00330444  
5.56366e-005 4.55259e-005 4.54848e-005 4.54685e-005 4.546e-005 4.5455e-005  
4.54518e-005 4.54496e-005 4.5448e-005 4.54469e-005  
6 1994 1 1994-6 0.0759641 0.69325 0.999338 0.857383 0.14368 0.00330444  
5.56366e-005 4.55259e-005 4.54848e-005 4.54685e-005 4.546e-005 4.5455e-005  
4.54518e-005 4.54496e-005 4.5448e-005 4.54469e-005  
6 1995 1 1995-6 0.0884999 0.733326 0.999411 0.823981 0.128032 0.00573296  
0.00316778 0.00316051 0.00316047 0.00316046 0.00316045 0.00316044 0.00316044  
0.00316044 0.00316044 0.00316043  
6 2006 1 2006-6 0.0884999 0.733326 0.999411 0.823981 0.128032 0.00573296  
0.00316778 0.00316051 0.00316047 0.00316046 0.00316045 0.00316044 0.00316044  
0.00316044 0.00316044 0.00316043  
6 2007 1 2007-6 0.0884999 0.733326 0.999411 0.823981 0.128032 0.00573296  
0.00316778 0.00316051 0.00316047 0.00316046 0.00316045 0.00316044 0.00316044  
0.00316044 0.00316044 0.00316043  
7 1982 1 1982-7 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
7 2006 1 2006-7 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
8 1982 1 1982-8 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
8 2006 1 2006-8 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
9 1982 1 1982-9 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
9 2006 1 2006-9 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
10 1982 1 1982-10 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
10 2006 1 2006-10 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
11 1982 1 1982-11 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
11 2006 1 2006-11 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
12 1982 1 1982-12 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
12 2006 1 2006-12 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
13 1982 1 1982-13 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
13 2006 1 2006-13 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
14 1982 1 1982-14 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
14 2006 1 2006-14 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
15 1982 1 1982-15 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
15 2006 1 2006-15 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
16 1982 1 1982-16 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
16 2006 1 2006-16 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
17 1982 1 1982-17 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
17 2006 1 2006-17 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
18 1982 1 1982-18 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
18 2006 1 2006-18 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
19 1982 1 1982-19 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
19 2006 1 2006-19 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
20 1982 1 1982-20 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
20 2006 1 2006-20 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
21 1982 1 1982-21 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
21 2006 1 2006-21 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0





7 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
 8 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
 9 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
 10 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
 11 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
 12 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
 13 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
 14 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
 15 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
 16 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
 17 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
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 19 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
 20 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
 21 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
 22 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
 23 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
 24 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
 25 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
 26 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
 27 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
 28 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
 29 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
 30 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
 31 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
 32 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
 33 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
 34 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
 35 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
 36 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
 37 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
 38 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
 39 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
 40 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
 41 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
 42 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
 43 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
 44 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
 45 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

AGE\_SELEX\_mortality\_in\_endyear

fleet year morph season label 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15  
 1 2006 1 1 sel\*wt 0.000454671 0.0457677 0.581737 1.22398 1.6606 2.08797  
 2.48737 2.84598 3.15601 3.41517 3.62609 3.79437 3.92666 4.02941 4.10827  
 4.16792  
 1 2006 1 1 sel\*ret\*wt 0.000454671 0.0457677 0.581737 1.22398 1.6606 2.08797  
 2.48737 2.84598 3.15601 3.41517 3.62609 3.79437 3.92666 4.02941 4.10827  
 4.16792  
 1 2006 1 1 sel\_nums 0.00253893 0.102677 0.720443 0.999541 0.999993 0.999909  
 0.999575 0.998994 0.998168 0.997095 0.995778 0.994218 0.992414 0.99037  
 0.988086 0.985564  
 1 2006 1 1 sel\*ret\_nums 0.00253893 0.102677 0.720443 0.999541 0.999993  
 0.999909 0.999575 0.998994 0.998168 0.997095 0.995778 0.994218 0.992414  
 0.99037 0.988086 0.985564  
 1 2006 1 1 dead\_nums 0.00253893 0.102677 0.720443 0.999541 0.999993 0.999909  
 0.999575 0.998994 0.998168 0.997095 0.995778 0.994218 0.992414 0.99037  
 0.988086 0.985564

1 2006 1 1 dead\*wt 0.000454671 0.0457677 0.581737 1.22398 1.6606 2.08797  
2.48737 2.84598 3.15601 3.41517 3.62609 3.79437 3.92666 4.02941 4.10827  
4.16792  
2 2006 1 1 sel\*wt 0.000190083 0.0175762 0.309487 1.19454 1.66053 2.08813  
2.48791 2.84698 3.15756 3.41732 3.62887 3.79779 3.93075 4.03416 4.11368  
4.17397  
2 2006 1 1 sel\*ret\*wt 0.000190083 0.0175762 0.309487 1.19454 1.66053 2.08813  
2.48791 2.84698 3.15756 3.41732 3.62887 3.79779 3.93075 4.03416 4.11368  
4.17397  
2 2006 1 1 sel\_nums 0.00106144 0.0394312 0.383279 0.9755 0.999953 0.999987  
0.999791 0.999348 0.998658 0.997722 0.996541 0.995116 0.993447 0.991537  
0.989386 0.986996  
2 2006 1 1 sel\*ret\_nums 0.00106144 0.0394312 0.383279 0.9755 0.999953  
0.999987 0.999791 0.999348 0.998658 0.997722 0.996541 0.995116 0.993447  
0.991537 0.989386 0.986996  
2 2006 1 1 dead\_nums 0.00106144 0.0394312 0.383279 0.9755 0.999953 0.999987  
0.999791 0.999348 0.998658 0.997722 0.996541 0.995116 0.993447 0.991537  
0.989386 0.986996  
2 2006 1 1 dead\*wt 0.000190083 0.0175762 0.309487 1.19454 1.66053 2.08813  
2.48791 2.84698 3.15756 3.41732 3.62887 3.79779 3.93075 4.03416 4.11368  
4.17397  
3 2006 1 1 sel\*wt 0.0110768 0.253509 0.806493 1.22452 1.66061 2.08816  
2.48843 2.84884 3.1618 3.42512 3.64146 3.81643 3.95667 4.06859 4.15781  
4.22799  
3 2006 1 1 sel\*ret\*wt 0.0110768 0.253509 0.806493 1.22452 1.66061 2.08816  
2.48843 2.84884 3.1618 3.42512 3.64146 3.81643 3.95667 4.06859 4.15781  
4.22799  
3 2006 1 1 sel\_nums 0.0618538 0.568734 0.998788 0.999986 0.999999 1 1 1 1 1  
1 1 1 1 1 0.999769  
3 2006 1 1 sel\*ret\_nums 0.0618538 0.568734 0.998788 0.999986 0.999999 1 1 1  
1 1 1 1 1 1 0.999769  
3 2006 1 1 dead\_nums 0.0618538 0.568734 0.998788 0.999986 0.999999 1 1 1 1 1  
1 1 1 1 1 0.999769  
3 2006 1 1 dead\*wt 0.0110768 0.253509 0.806493 1.22452 1.66061 2.08816  
2.48843 2.84884 3.1618 3.42512 3.64146 3.81643 3.95667 4.06859 4.15781  
4.22799  
4 2006 1 1 sel\*wt 0.00192348 0.12453 0.79532 1.22355 1.22081 1.07687 1.24587  
1.42593 1.58258 1.71438 1.82266 1.91024 1.98044 2.03646 2.08111 2.11673  
4 2006 1 1 sel\*ret\*wt 0.00192348 0.12453 0.79532 1.22355 1.22081 1.07687  
1.24587 1.42593 1.58258 1.71438 1.82266 1.91024 1.98044 2.03646 2.08111  
2.11673  
4 2006 1 1 sel\_nums 0.0107409 0.279376 0.984951 0.999189 0.735157 0.515702  
0.500663 0.500531 0.500531 0.500531 0.500531 0.500531 0.500531 0.500531  
0.500531 0.500531  
4 2006 1 1 sel\*ret\_nums 0.0107409 0.279376 0.984951 0.999189 0.735157  
0.515702 0.500663 0.500531 0.500531 0.500531 0.500531 0.500531 0.500531  
0.500531 0.500531  
4 2006 1 1 dead\_nums 0.0107409 0.279376 0.984951 0.999189 0.735157 0.515702  
0.500663 0.500531 0.500531 0.500531 0.500531 0.500531 0.500531 0.500531  
0.500531 0.500531  
4 2006 1 1 dead\*wt 0.00192348 0.12453 0.79532 1.22355 1.22081 1.07687  
1.24587 1.42593 1.58258 1.71438 1.82266 1.91024 1.98044 2.03646 2.08111  
2.11673  
5 2006 1 1 sel\*wt 0.00107597 0.0499642 0.496698 1.22345 1.66058 2.08807  
2.48765 2.84649 3.15678 3.41623 3.62745 3.79604 3.92865 4.03172 4.11089  
4.17085

5 2006 1 1 sel\*ret\*wt 0.00107597 0.0499642 0.496698 1.22345 1.66058 2.08807  
 2.48765 2.84649 3.15678 3.41623 3.62745 3.79604 3.92865 4.03172 4.11089  
 4.17085  
 5 2006 1 1 sel\_nums 0.00600833 0.112092 0.615127 0.999111 0.999986 0.999956  
 0.999688 0.999173 0.998412 0.997404 0.996152 0.994656 0.992918 0.990937  
 0.988717 0.986258  
 5 2006 1 1 sel\*ret\_nums 0.00600833 0.112092 0.615127 0.999111 0.999986  
 0.999956 0.999688 0.999173 0.998412 0.997404 0.996152 0.994656 0.992918  
 0.990937 0.988717 0.986258  
 5 2006 1 1 dead\_nums 0.00600833 0.112092 0.615127 0.999111 0.999986 0.999956  
 0.999688 0.999173 0.998412 0.997404 0.996152 0.994656 0.992918 0.990937  
 0.988717 0.986258  
 5 2006 1 1 dead\*wt 0.00107597 0.0499642 0.496698 1.22345 1.66058 2.08807  
 2.48765 2.84649 3.15678 3.41623 3.62745 3.79604 3.92865 4.03172 4.11089  
 4.17085  
 6 2006 1 1 sel\*wt 0.0158485 0.326875 0.806996 1.009 0.212611 0.0119713  
 0.0078828 0.00900379 0.00999278 0.0108249 0.0115086 0.0120616 0.0125048  
 0.0128585 0.0131405 0.0133654  
 6 2006 1 1 sel\*ret\*wt 0.0158485 0.326875 0.806996 1.009 0.212611 0.0119713  
 0.0078828 0.00900379 0.00999278 0.0108249 0.0115086 0.0120616 0.0125048  
 0.0128585 0.0131405 0.0133654  
 6 2006 1 1 sel\_nums 0.0884999 0.733326 0.999411 0.823981 0.128032 0.00573296  
 0.00316778 0.00316051 0.00316047 0.00316046 0.00316045 0.00316044 0.00316044  
 0.00316044 0.00316044 0.00316043  
 6 2006 1 1 sel\*ret\_nums 0.0884999 0.733326 0.999411 0.823981 0.128032  
 0.00573296 0.00316778 0.00316051 0.00316047 0.00316046 0.00316045 0.00316044  
 0.00316044 0.00316044 0.00316043  
 6 2006 1 1 dead\_nums 0.0884999 0.733326 0.999411 0.823981 0.128032  
 0.00573296 0.00316778 0.00316051 0.00316047 0.00316046 0.00316045 0.00316044  
 0.00316044 0.00316044 0.00316043  
 6 2006 1 1 dead\*wt 0.0158485 0.326875 0.806996 1.009 0.212611 0.0119713  
 0.0078828 0.00900379 0.00999278 0.0108249 0.0115086 0.0120616 0.0125048  
 0.0128585 0.0131405 0.0133654

ENVIRONMENTAL\_DATA Begins\_in\_startyr-1

NUMBERS\_AT\_AGE

Population 1 gmorph 1 gender: 1 GrowPattern: 1 birthseason: 1  
 Year Per Seas 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15  
 1980 VIRG 1 59911.2 49051.1 40159.7 32879.9 26919.8 22040.1 18044.9 14773.9  
 12095.9 9903.25 8108.09 6638.35 5435.02 4449.82 3643.2 16421.7  
 1981 INIT 1 37379.9 29774.9 14685 3385.93 780.172 179.765 41.4336 9.55585  
 2.20592 0.509859 0.118028 0.0273734 0.00636232 0.00148244 0.000346376  
 0.000106143  
 1982 TIME 1 47391.2 29774.9 14685 3385.93 780.172 179.765 41.4336 9.55585  
 2.20592 0.509859 0.118028 0.0273734 0.00636232 0.00148244 0.000346376  
 0.000106143  
 1983 TIME 1 56997.8 37028.8 12864.2 2906.03 600.461 140.358 32.4448 7.48385  
 1.72785 0.399442 0.0924915 0.0214578 0.00498926 0.00116302 0.000271879  
 8.33728e-005  
 1984 TIME 1 39199.6 45427.8 19555.4 3294.06 658.095 138.172 32.4092 7.49623  
 1.73059 0.400021 0.0926128 0.021483 0.00499444 0.00116407 0.000272087  
 8.34256e-005  
 1985 TIME 1 47705.8 30632.9 19150.8 3211.37 448.502 90.9878 19.1695 4.50013  
 1.04214 0.240986 0.0558192 0.0129558 0.00301417 0.000703115 0.000164502  
 5.05077e-005

1986 TIME 1 50405.6 37501 13693.6 3588.64 520.949 73.0265 14.8315 3.12703  
 0.734903 0.170446 0.0394894 0.00916796 0.00213365 0.000497928 0.000116556  
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 1987 TIME 1 35763.9 39105.7 14476.6 2071.15 484.227 72.2723 10.1911 2.07174  
 0.437349 0.102958 0.0239298 0.00555834 0.0012943 0.000302251 7.08074e-005  
 2.17844e-005  
 1988 TIME 1 10933.3 28102.3 17615.8 2945.75 382.75 91.6098 13.7412 1.93914  
 0.394613 0.0834193 0.0196724 0.00458195 0.0010669 0.000249133 5.83632e-005  
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 1989 TIME 1 23928.4 8463.62 10163.9 2138.1 310.943 41.165 9.89392 1.48556  
 0.20994 0.0428049 0.0090707 0.00214535 0.000501385 0.000117202 2.74885e-005  
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 1990 TIME 1 29096.3 18452.8 3755.51 1956.11 361.099 52.7328 6.98935 1.68102  
 0.252662 0.0357563 0.00730328 0.00155092 0.000367732 8.61878e-005 2.0212e-005  
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 1991 TIME 1 26507 22155 8491.22 930.556 436.938 82.5632 12.1159 1.60688  
 0.386782 0.0581976 0.00824729 0.0016873 0.000359009 8.53115e-005 2.0045e-005  
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 1992 TIME 1 32693.2 20208.9 9299.95 1672.27 163.858 79.6382 15.1559 2.22586  
 0.295496 0.0712218 0.0107345 0.00152428 0.000312589 6.66902e-005 1.5896e-005  
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 1993 TIME 1 30696.7 25126.3 8225.58 1638.88 272.141 27.4072 13.3975 2.55181  
 0.375178 0.0498801 0.0120444 0.00181935 0.000259013 5.32737e-005 1.14036e-005  
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 1994 TIME 1 28514.4 23534.2 10683.3 1728.08 318.144 56.4245 5.75841 2.81742  
 0.537127 0.0790686 0.0105286 0.00254709 0.000385588 5.50323e-005 1.1351e-005  
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 1995 TIME 1 32953.6 22150.4 10504.7 2353.02 349.054 69.7074 12.636 1.29119  
 0.632305 0.120691 0.0177934 0.00237365 0.00057546 8.7328e-005 1.24979e-005  
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 1996 TIME 1 24358.2 26672.9 14786.3 2849.11 324.406 49.8088 10.0666 1.82649  
 0.186804 0.0916001 0.0175145 0.00258773 0.000346094 8.41572e-005 1.28147e-005  
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 1997 TIME 1 26808.5 19737.2 18332.7 4860.88 533.51 62.1125 9.60578 1.9426  
 0.352726 0.0361142 0.0177341 0.00339691 0.000502953 6.74335e-005 1.64435e-005  
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 1998 TIME 1 28696.3 21788.8 14333.2 8255.47 1590.05 177.898 20.8106 3.21969  
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 1.1711 0.23709 0.0431136 0.00442264 0.00217679 0.000418092 6.20972e-005  
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 138.456 27.5625 3.10806 0.36442 0.0565396 0.0114799 0.00209474 0.000346542  
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 158.122 69.9091 13.9235 1.57101 0.184332 0.0286225 0.00581701 0.00123853  
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 216.407 79.6514 35.2328 7.02145 0.792817 0.0931021 0.0144705 0.0035716

2006 TIME 1 26414.8 11411.5 17653.4 7654.51 5438.5 2470.41 1231.56 477.515  
 274.123 113.253 41.7031 18.4572 3.68075 0.41593 0.0488867 0.00948512  
 2007 FORE 1 43744.6 21516.7 8733.29 10930.5 4125.69 3003.64 1371.33 683.804  
 265.186 152.278 62.9374 23.1866 10.268 2.04902 0.231717 0.032552

CATCH\_AT\_AGE

fleet 1 fleetarea 1 gmorph 1  
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 1987 1 539.255 8437.87 5669.75 783.249 184.701 27.6109 3.8926 0.791044  
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 1988 1 220.495 7440.15 7740.25 1236.47 161.645 38.7328 5.80888 0.819524  
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 1993 1 338.921 3917.99 2415.59 467.588 79.5672 8.05117 3.93506 0.749217  
 0.110096 0.0146279 0.00352944 0.000532652 7.57536e-005 1.5563e-005 3.32724e-  
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 1989 1 83.9429 341.353 1360.56 403.676 58.8432 7.79307 1.87297 0.281179  
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 1990 1 83.6021 623.039 455.762 337.424 62.8966 9.20175 1.21957 0.293253  
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1991 1 83.4701 787.422 1034.65 160.974 76.6016 14.5116 2.12955 0.282383  
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 1998 1 3.26331 87.4723 459.418 593.307 118.318 13.2721 1.55256 0.240137  
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 0.214683 0.0332198 0.00672329 0.00122215 0.000125317 6.16507e-005 1.18349e-  
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 2001 1 1.85306 53.3617 270.425 424.965 174.661 63.8838 28.2145 5.61133  
 0.631885 0.0739547 0.0114484 0.00231832 0.000421717 4.32788e-005 2.13126e-005  
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 2002 1 2.74167 72.1536 459.467 483.302 279.31 114.952 42.2679 18.6699  
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 1.44043 0.162279 0.019006 0.0029449 0.000597037 0.000108755 1.79577e-005  
 2004 1 2.46446 52.9531 492.958 609.815 305.098 117.89 67.6364 27.9176  
 10.2662 4.53564 0.902518 0.10172 0.0119195 0.00184806 0.000374948 7.96814e-  
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 2005 1 0.962926 57.4187 276.475 544.744 249.722 124.098 48.1001 27.5966  
 11.3914 4.18965 1.85151 0.368565 0.0415606 0.00487309 0.000756097 0.00018626  
 2006 1 1.7031 26.5257 361.135 374.193 275.533 125.45 62.5347 24.2381 13.9064  
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1991 1 680.586 1247.02 353.545 37.1905 17.6828 3.35001 0.491749 0.0652417  
0.0157116 0.00236551 0.000335469 6.86924e-005 1.46302e-005 3.48034e-006  
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0.00764412 0.00184363 0.000278091 3.95252e-005 8.11415e-006 1.73315e-006  
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1993 1 573.973 1032.86 254.809 49.2991 8.38905 0.849068 0.41519 0.0791084  
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1996 1 32.029 298.202 210.058 32.5822 3.74035 0.575819 0.116403 0.0211259  
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1997 1 18.9374 121.478 159.528 37.0122 4.0944 0.477617 0.0738763 0.0149431  
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0.038551 0.00780648 0.00141997 0.000145711 7.17459e-005 1.37863e-005  
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2000 1 33.2858 192.664 274.793 124.277 44.5081 19.5822 3.89494 0.438747  
0.0513718 0.00795665 0.00161224 0.00029349 3.01445e-005 1.48584e-005  
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2001 1 12.5664 89.5672 82.008 50.6957 20.3267 7.43442 3.28408 0.653431  
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0.388482 0.0437956 0.00513337 0.000796133 0.000161576 2.94678e-005 3.03307e-  
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2003 1 15.205 157.551 167.255 88.6754 33.738 19.3042 7.96947 2.93176 1.29593  
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Year Seas 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15  
1981 E 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
1982 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0



1983 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
1984 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
1985 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
1986 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
1987 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
1988 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
1989 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
1990 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
1991 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
1992 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
1993 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
1994 1 44.0814 408.846 279.845 42.8083 2.15663 0.0139383 1.3841e-005  
3.39134e-006 6.45757e-007 9.50739e-008 1.26659e-008 3.06625e-009 4.64575e-010  
6.63713e-011 1.37054e-011 3.99751e-012  
1995 1 6.38478 101.876 115.652 20.4726 2.26123 0.318092 0.0559977 0.00572231  
0.00280354 0.000535449 7.90002e-005 1.05481e-005 2.55993e-006 3.88939e-007  
5.57371e-008 1.4987e-008  
1996 1 2.15598 56.7828 80.2986 12.62 1.06591 0.115109 0.0225911 0.00409895  
0.000419389 0.000205757 3.93679e-005 5.82108e-006 7.79247e-007 1.89681e-007  
2.89165e-008 5.2811e-009  
1997 1 1.38038 25.0485 66.0365 15.524 1.2635 0.103391 0.0155259 0.00313961  
0.000570231 5.84052e-005 2.86934e-005 5.49912e-006 8.14725e-007 1.09313e-007  
2.66772e-008 4.82516e-009  
1998 1 2.08414 39.115 74.513 38.3552 5.49003 0.431985 0.049069 0.00759096  
0.00153625 0.000279227 2.86266e-005 1.408e-005 2.70212e-006 4.00963e-007  
5.38933e-008 1.55651e-008  
1999 1 3.79711 99.4488 207.672 82.8128 26.3569 3.66055 0.400149 0.0468228  
0.00724842 0.00146779 0.000266985 2.73968e-005 1.34898e-005 2.59211e-006  
3.85186e-007 6.68489e-008  
2000 1 1.56431 25.6135 73.3392 33.6074 8.85541 2.73305 0.527759 0.0594338  
0.00695895 0.00107783 0.000218398 3.97569e-005 4.08345e-006 2.01276e-006  
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2001 1 2.80274 56.5102 103.871 65.0612 19.1931 4.92429 2.11182 0.420076  
0.047337 0.00554543 0.000859465 0.000174292 3.17582e-005 3.26547e-006  
1.61157e-006 3.6474e-007  
2002 1 1.68198 30.9934 71.5842 30.0125 12.4495 3.59405 1.28325 0.566916  
0.112834 0.0127203 0.00149097 0.000231235 4.69294e-005 8.55885e-006 8.80947e-  
007 5.33839e-007  
2003 1 0.617111 18.0886 38.55 20.709 5.797 2.32678 0.932564 0.342975  
0.151606 0.0301866 0.00340487 0.000399347 6.1981e-005 1.259e-005 2.29836e-006  
3.80425e-007  
2004 1 0.707625 10.6458 35.9456 17.7237 6.36468 1.72511 0.961066 0.396761  
0.146003 0.0645648 0.0128626 0.00145177 0.000170405 2.64712e-005 5.38236e-006  
1.14659e-006  
2005 1 0.373766 15.605 27.2533 21.4031 7.0424 2.4549 0.923943 0.530192  
0.219004 0.0806236 0.0356718 0.00711106 0.000803214 9.43603e-005 1.46725e-005  
3.62325e-006  
2006 1 0.661617 7.21502 35.6281 14.7143 7.77672 2.4837 1.20221 0.466052  
0.267579 0.110568 0.0407234 0.0180283 0.0035963 0.000406526 4.77998e-005  
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fleet 5 fleetarea 1 gmorph 1  
Year Seas 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15  
1981 E 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
1982 1 1213.05 6785.06 4154.17 920.983 213.309 49.1928 11.3354 2.61323  
0.602944 0.139273 0.0322168 0.00746549 0.00173352 0.000403482 9.41627e-005  
2.88176e-005

1983 1 206.494 1291.96 562.687 121.353 25.2267 5.90279 1.36405 0.314492  
 0.0725663 0.0167637 0.00387838 0.000898897 0.000208776 4.86069e-005 1.13473e-  
 005 3.4745e-006  
 1984 1 813.347 8302.77 4189.79 661.537 132.857 27.9193 6.54701 1.51376  
 0.349305 0.0806953 0.0186703 0.00432758 0.00100523 0.00023407 5.46534e-005  
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 1985 1 783.176 4530.38 3395.59 541.006 75.6535 15.3494 3.23295 0.758653  
 0.175601 0.0405819 0.00939327 0.00217843 0.000506346 0.000117994 2.75748e-005  
 8.45585e-006  
 1986 1 1313.19 8318.4 3590.49 905.255 132.668 18.6298 3.78284 0.797281  
 0.18729 0.0434142 0.0100519 0.00233193 0.000542254 0.000126426 2.95634e-005  
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 1987 1 589.382 5826.13 2656.86 367.194 86.5854 12.9429 1.8246 0.370771  
 0.0782295 0.0184045 0.00427441 0.00099198 0.000230761 5.38291e-005 1.2595e-  
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 1988 1 258.655 5513.77 3892.96 622.156 81.3313 19.4873 2.92241 0.412275  
 0.0838639 0.0177198 0.0041764 0.000972098 0.000226184 5.27731e-005 1.23516e-  
 005 3.79678e-006  
 1989 1 208.728 669.077 975.922 195.958 28.5393 3.77872 0.907937 0.136268  
 0.0192473 0.00392181 0.000830428 0.000196236 4.58162e-005 1.0698e-005  
 2.50616e-006 7.92666e-007  
 1990 1 421.138 2473.99 662.287 331.832 61.7993 9.03894 1.19768 0.287916  
 0.0432479 0.00611571 0.00124802 0.000264754 6.27008e-005 1.46763e-005  
 3.43704e-006 1.12541e-006  
 1991 1 488.311 3631.19 1746.07 183.846 87.4082 16.5546 2.42873 0.321973  
 0.0774576 0.011647 0.00164921 0.000337102 7.16514e-005 1.70069e-005 3.99112e-  
 006 1.30799e-006  
 1992 1 555.528 3003.64 1687.12 295.099 29.1987 14.2163 2.70485 0.397087  
 0.0526888 0.0126914 0.00191143 0.00027119 5.55604e-005 1.18409e-005 2.81911e-  
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 1993 1 593.675 4335.69 1814.16 351.323 59.7802 6.04865 2.95616 0.562808  
 0.0826992 0.0109872 0.00265087 0.00040004 5.68904e-005 1.16871e-005 2.49846e-  
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 1994 1 518.612 3875.5 2241.49 351.323 66.6799 11.9208 1.2165 0.59493  
 0.113355 0.0166748 0.00221852 0.000536187 8.10812e-005 1.1558e-005 2.38077e-  
 006 6.9251e-007  
 1995 1 76.1841 871.889 1540.67 436.66 65.6088 13.1565 2.38503 0.243661  
 0.119287 0.0227595 0.00335373 0.000447119 0.000108322 1.64248e-005 2.3485e-  
 006 6.29912e-007  
 1996 1 76.3329 1441.97 3174.04 798.694 91.7672 14.1269 2.85502 0.517889  
 0.052948 0.0259507 0.00495897 0.00073215 9.78389e-005 2.3768e-005 3.61527e-  
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 1997 1 74.6995 972.239 3989.69 1501.67 166.263 19.3942 2.99903 0.606305  
 0.110036 0.0112589 0.00552436 0.00105716 0.00015635 2.09359e-005 5.09785e-006  
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 1998 1 65.4135 880.556 2611.02 2151.88 419.002 46.998 5.49736 0.850227  
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 1.72083e-006  
 1999 1 26.7183 501.914 1631.44 1041.61 450.974 89.2837 10.0504 1.17574  
 0.181872 0.0367915 0.00668383 0.000684836 0.000336613 6.45525e-005 9.57097e-  
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 0.902581 0.139654 0.0282623 0.00513711 0.000526712 0.000259102 4.97352e-005  
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 2001 1 38.6351 558.726 1598.57 1603.15 643.345 235.295 103.911 20.6645  
 2.32684 0.272309 0.0421511 0.00853506 0.00155247 0.000159312 7.8447e-005  
 1.77104e-005

2002 1 26.4783 349.953 1258.12 844.545 476.561 196.12 72.108 31.8481 6.33392  
 0.713334 0.0835065 0.0129315 0.00261988 0.000476854 4.89717e-005 2.96023e-005  
 2003 1 24.1914 508.6 1687.17 1451.15 552.589 316.171 130.492 47.9798 21.1924  
 4.21541 0.474877 0.0556132 0.00861641 0.00174673 0.000318159 5.25308e-005  
 2004 1 27.4416 296.111 1556.29 1228.61 600.182 231.896 133.035 54.9075  
 20.1898 8.91927 1.77466 0.200002 0.0234345 0.00363314 0.000737067 0.000156625  
 2005 1 12.6429 378.602 1029.2 1294.12 579.25 287.838 111.557 63.9992 26.4158  
 9.71482 4.29291 0.854494 0.0963486 0.0112963 0.00175258 0.000431708  
 2006 1 24.1695 189.048 1453.08 960.844 690.808 314.506 156.764 60.7565  
 34.8561 14.3886 5.29282 2.33962 0.465894 0.0525596 0.00616617 0.00119391  
 fleet 6 fleetarea 1 gmorph 1  
 Year Seas 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15  
 1981 E 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 1982 1 65.3854 286.305 148.918 28.2982 1.09839 0.00582748 2.2621e-005  
 4.27067e-006 9.8549e-007 2.27847e-007 5.27768e-008 1.22502e-008 2.8501e-009  
 6.64846e-010 1.55544e-010 4.77333e-011  
 1983 1 88.5389 433.659 160.455 29.6606 1.03332 0.00556236 2.16537e-005  
 4.08838e-006 9.43482e-007 2.18158e-007 5.05399e-008 1.17332e-008 2.73047e-009  
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 1984 1 58.4269 466.909 200.165 27.0891 0.911732 0.00440775 1.74122e-005  
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 1985 1 18.3189 82.9561 52.8222 7.21351 0.169051 0.000789059 2.79972e-006  
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 1986 1 132.846 658.768 241.565 52.2028 1.28213 0.00414193 1.41681e-005  
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 1987 1 80.1506 620.244 240.292 28.4648 1.12487 0.00386828 9.18656e-006  
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 2.2378e-010 5.24904e-011 1.61716e-011  
 1988 1 19.5607 326.426 195.796 26.8205 0.587581 0.00323885 8.18237e-006  
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 1989 1 10.0293 25.1673 31.1863 5.36729 0.131002 0.000399033 1.61517e-006  
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 1990 1 63.9551 294.118 66.8893 28.7257 0.896562 0.00301678 6.73388e-006  
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 1991 1 85.8975 500.041 204.27 18.435 1.46887 0.00639999 1.58175e-005  
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 1992 1 84.4885 357.612 170.646 25.5836 0.42423 0.00475175 1.52303e-005  
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 1993 1 189.539 1083.63 385.2 63.9382 1.82329 0.0042441 3.49424e-005  
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 1994 1 120.941 707.506 347.638 46.7025 1.48549 0.00610957 1.05031e-005  
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 1995 1 161.278 819.795 359.759 51.7569 1.20728 0.0108408 0.00108619  
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1996 1 82.218 689.834 377.101 48.167 0.859167 0.00592258 0.000661555  
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 1997 1 62.7453 362.719 369.653 70.6241 1.21393 0.0063408 0.000541933  
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 1998 1 84.067 502.629 370.134 154.842 4.68068 0.0235097 0.00151989  
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 1999 1 57.8248 482.466 389.463 126.219 8.48381 0.0752117 0.0046794  
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 2000 1 94.7947 494.467 547.3 203.828 11.3424 0.223454 0.0245587 0.00276007  
 0.000323166 5.00528e-005 1.01421e-005 1.84625e-006 1.89628e-007 9.34691e-008  
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 2001 1 129.18 829.746 589.57 300.125 18.6979 0.30622 0.074744 0.0148376  
 0.00167199 0.000195869 3.03568e-005 6.1561e-006 1.12172e-006 1.15338e-007  
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 2002 1 81.9086 480.821 429.292 146.277 12.8143 0.23614 0.0479871 0.0211568  
 0.00421081 0.000474704 5.56409e-005 8.62931e-006 1.75133e-006 3.19402e-007  
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 2003 1 59.0019 550.953 453.894 198.166 11.715 0.300148 0.0684682 0.0251299  
 0.011108 0.00221174 0.000249471 2.92596e-005 4.54126e-006 9.22449e-007  
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 2004 1 96.4511 462.26 603.362 241.784 18.3365 0.317249 0.100592 0.0414436  
 0.0152505 0.00674399 0.00134353 0.000151641 1.77992e-005 2.76498e-006  
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 2005 1 47.3244 629.442 424.945 271.224 18.847 0.41937 0.0898334 0.0514449  
 0.0212499 0.00782284 0.0034612 0.000689978 7.79347e-005 9.15565e-006  
 1.42366e-006 3.51559e-007  
 2006 1 77.6218 269.663 514.751 172.776 19.2845 0.393146 0.108309 0.0419021  
 0.0240574 0.00994089 0.00366132 0.00162087 0.000323332 3.65494e-005 4.29752e-  
 006 8.34171e-007

BIOLOGY 1 70 15 1 N\_Used\_morphs;\_lengths;\_ages;\_season;\_by\_season\_in\_endyr  
 bin low Mean\_Size Wt\_len-F mat\_len spawn Wt\_len-M  
 1 10 10.5 0.0063863 1 0.0063863  
 2 11 11.5 0.00865928 1 0.00865928  
 3 12 12.5 0.0114467 1 0.0114467  
 4 13 13.5 0.0148098 1 0.0148098  
 5 14 14.5 0.0188113 1 0.0188113  
 6 15 15.5 0.0235157 1 0.0235157  
 7 16 16.5 0.0289892 1 0.0289892  
 8 17 17.5 0.0352991 1 0.0352991  
 9 18 18.5 0.0425145 1 0.0425145  
 10 19 19.5 0.0507059 1 0.0507059  
 11 20 20.5 0.0599448 1 0.0599448  
 12 21 21.5 0.0703042 1 0.0703042  
 13 22 22.5 0.0818585 1 0.0818585  
 14 23 23.5 0.0946829 1 0.0946829  
 15 24 24.5 0.108854 1 0.108854  
 16 25 25.5 0.12445 1 0.12445  
 17 26 26.5 0.14155 1 0.14155  
 18 27 27.5 0.160232 1 0.160232  
 19 28 28.5 0.180579 1 0.180579  
 20 29 29.5 0.202673 1 0.202673  
 21 30 30.5 0.226596 1 0.226596

22 31 31.5 0.252433 1 0.252433  
 23 32 32.5 0.280267 1 0.280267  
 24 33 33.5 0.310187 1 0.310187  
 25 34 34.5 0.342277 1 0.342277  
 26 35 35.5 0.376627 1 0.376627  
 27 36 36.5 0.413324 1 0.413324  
 28 37 37.5 0.452458 1 0.452458  
 29 38 38.5 0.494119 1 0.494119  
 30 39 39.5 0.538399 1 0.538399  
 31 40 40.5 0.58539 1 0.58539  
 32 41 41.5 0.635184 1 0.635184  
 33 42 42.5 0.687876 1 0.687876  
 34 43 43.5 0.743558 1 0.743558  
 35 44 44.5 0.802328 1 0.802328  
 36 45 45.5 0.86428 1 0.86428  
 37 46 46.5 0.929512 1 0.929512  
 38 47 47.5 0.99812 1 0.99812  
 39 48 48.5 1.0702 1 1.0702  
 40 49 49.5 1.14586 1 1.14586  
 41 50 50.5 1.22519 1 1.22519  
 42 51 51.5 1.3083 1 1.3083  
 43 52 52.5 1.39527 1 1.39527  
 44 53 53.5 1.48623 1 1.48623  
 45 54 54.5 1.58127 1 1.58127  
 46 55 55.5 1.68048 1 1.68048  
 47 56 56.5 1.78398 1 1.78398  
 48 57 57.5 1.89188 1 1.89188  
 49 58 58.5 2.00426 1 2.00426  
 50 59 59.5 2.12125 1 2.12125  
 51 60 60.5 2.24294 1 2.24294  
 52 61 61.5 2.36945 1 2.36945  
 53 62 62.5 2.50088 1 2.50088  
 54 63 63.5 2.63734 1 2.63734  
 55 64 64.5 2.77893 1 2.77893  
 56 65 65.5 2.92577 1 2.92577  
 57 66 66.5 3.07797 1 3.07797  
 58 67 67.5 3.23564 1 3.23564  
 59 68 68.5 3.39888 1 3.39888  
 60 69 69.5 3.56782 1 3.56782  
 61 70 70.5 3.74255 1 3.74255  
 62 71 71.5 3.9232 1 3.9232  
 63 72 72.5 4.10988 1 4.10988  
 64 73 73.5 4.30271 1 4.30271  
 65 74 74.5 4.50178 1 4.50178  
 66 75 75.5 4.70723 1 4.70723  
 67 76 76.5 4.91917 1 4.91917  
 68 77 77.5 5.13771 1 5.13771  
 69 78 78.5 5.36296 1 5.36296  
 70 79 79.5 5.59506 1 5.59506

Growth\_Parameters

Count Yr Morph A1 A2 L-at-A1 L-at-A2 K A-at-L0 Linf CVmin CVmax natM\_amin  
 natM\_max M\_young M\_old  
 1 1982 1 0.5 6 28.1 60.2 0.2052 -1.76669 75.5491 0.1 0.1 0 2 0.2 0.2

Season gmorph GrowPattern Sex BirthSeas age age\_Beg age\_Mid M Len\_Beg Len\_Mid  
 SD\_Beg SD\_Mid Wt\_Beg Wt\_Mid Len\_Mat Age\_Mat Mat\*Fecund Len:\_1 SelWt:\_1

















1 1996 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
1 1996 1 1 28.1 36.9026 44.0721 49.9116 54.6677 58.5416 61.6967 64.2666  
66.3596 68.0644 69.453 70.5839 71.505 72.2553 72.8663 73.364  
1 1997 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
1 1997 1 1 28.1 36.9026 44.0721 49.9116 54.6677 58.5416 61.6967 64.2666  
66.3596 68.0644 69.453 70.5839 71.505 72.2553 72.8663 73.364  
1 1998 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
1 1998 1 1 28.1 36.9026 44.0721 49.9116 54.6677 58.5416 61.6967 64.2666  
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3.44363e-010 2.66291e-010 2.16559e-010 1.83321e-010  
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 mean 28.1 36.9026 44.0721 49.9116 54.6677 58.5416 61.6967 64.2666 66.3596 68.0644 69.453 70.5839 71.505 72.2553 72.8663 73.364  
 sdsz 2.81 3.69026 4.40721 4.99116 5.46677 5.85416 6.16967 6.42666 6.63596 6.80644 6.9453 7.05839 7.1505 7.22553 7.28663 7.3364

AGE AGE\_KEY

KEY: 1

mean 0.5 1.5 2.5 3.5 4.5 5.5 6.5 7.5 8.5 9.5 10.5 11.5 12.5 13.5 14.5 15.5  
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 6 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0  
 5 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0  
 4 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0  
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 2 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0  
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 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0

Composition\_Database

year	season	fleet	rep	pick_gender	kind	mkt	ageerr	gender	Lbin_lo	Lbin_hi	bin						
obs	exp	Pearson	N	effN	Like	Used											
1982	1	1	1	0	AGE	0	1	1	1	70	0	0.0999438	0.0530772	2.95642	200	85.5962	12.6501
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1982	1	1	1	0	AGE	0	1	1	1	70	1	0.476731	0.456822	0.565234	200	85.5962	4.06741
1																	
1982	1	1	1	0	AGE	0	1	1	1	70	2	0.390191	0.381253	0.260239	200	85.5962	1.80831
1																	
1982	1	1	1	0	AGE	0	1	1	1	70	3	0.0161747	0.0833381	-3.43654	200	85.5962	-5.30355
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1982	1	1	1	0	AGE	0	1	1	1	70	4	0.00432648	0.0194175	-1.54666	200	85.5962	-1.29917
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1982	1	1	1	0	AGE	0	1	1	1	70	6	0.00404933	0.00112714	1.23163	200	85.5962	1.03571
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1982	1	1	1	0	AGE	0	1	1	1	70	7	0.00176283	0.000407879	0.948988	200	85.5962	0.516052
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1982	1	1	1	0	AGE	0	1	1	1	70							
1982	1	2	1	0	AGE	0	1	1	1	70	0	0.17237	0.0433609	8.95802	200	3.2155	47.577
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1982	1	2	1	0	AGE	0	1	1	1	70	1	0.608225	0.299001	9.55198	200	3.2155	86.38
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1982	1	6	1	0	AGE	0	1	1	1	70	0	0.212929	0.129703	3.50319	200	16.2957	21.1102
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5.00569 1  
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0.719282 1  
1983 1 1 1 0 AGE 0 1 1 1 70 5 0.00334187 0.00344786 -0.0255715 200 26.1453 -  
0.0208688 1  
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0.0177496 1  
1983 1 1 1 0 AGE 0 1 1 1 70 7 0.00130258 0.000331903 0.753626 200 26.1453  
0.356192 1  
1983 1 1 1 0 AGE 0 1 1 1 70  
1983 1 2 1 0 AGE 0 1 1 1 70 0 0.0778858 0.047458 2.0239 200 7.69229 7.71689 1  
1983 1 2 1 0 AGE 0 1 1 1 70 1 0.597407 0.370473 6.6455 200 7.69229 57.0902 1  
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45 1982 A 1 3 0

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45 2006 L 1 79 1

**SS2 ALTERNATIVE RUN (F08 SVAge comp.REP)**

Code\_version: \_\_2.00o;\_01/31/08;\_Stock\_Synthesis\_2\_by\_Richard\_Methot\_(NOAA);\_  
using\_Otter\_Research\_ADMB\_7.0.1

Time: Mon Mar 24 10:22:43 2008

Data\_File: F08\_MULTI\_SVAGE.DAT  
Control\_File: F08\_MULTI\_SVAGE.CTL

Convergence\_Level:  
Hessian:  
Sum\_of\_months\_on\_read\_was:\_ 12 rescaled\_to\_sum\_to: 1

LIKELIHOOD 4856.09  
indices 846.218  
discard 0  
length\_comps 0  
age\_comps 3994.71  
size-at-age 0  
mean\_body\_wt 0  
Equil\_catch 0  
catch 15.1549  
Recruitment 0  
Parm\_priors 0  
Parm\_devs 0  
penalties 0  
Forecast\_Recruitment 0

Fleet surv\_lambda surv\_like disc\_lambda disc\_like length\_lambda length\_like  
age\_lambda age\_like sizeage\_lambda sizeage\_like  
1 0 0 0 0 0 0 1 227.475 0 0  
2 0 0 0 0 0 0 1 669.724 0 0  
3 0 0 0 0 0 0 1 306.226 0 0  
4 0 0 0 0 0 0 1 167.667 0 0  
5 0 0 0 0 0 0 1 210.481 0 0  
6 0 0 0 0 0 0 1 165.856 0 0  
7 1 51.8476 0 0 0 0 1 95.0189 0 0  
8 1 46.9423 0 0 0 0 1 215.315 0 0  
9 1 26.899 0 0 0 0 1 223.489 0 0  
10 1 172.422 0 0 0 0 1 164.952 0 0  
11 1 259.163 0 0 0 0 1 464.187 0 0  
12 1 38.1829 0 0 0 0 1 139.974 0 0  
13 1 27.8704 0 0 0 0 1 173.175 0 0  
14 1 59.5867 0 0 0 0 1 354.729 0 0  
15 1 38.0936 0 0 0 0 1 132.604 0 0  
16 1 12.1586 0 0 0 0 1 283.841 0 0  
17 1 27.6408 0 0 0 0 1 0 0 0  
18 1 29.2281 0 0 0 0 1 0 0 0  
19 1 56.1833 0 0 0 0 1 0 0 0

Source Lambda Like  
mean\_body\_wt 0 0  
Equil\_catch 0 0  
Catch 10 1.51549

Recruitment 0 0  
 Parm\_priors 0 0  
 Parm\_devs 1 0  
 penalties 0

Variance\_adjustments\_to\_input\_values 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16  
 17 18 19  
 Index\_extra\_CV 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 Discard\_extra\_CV 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 MeanBodyWt\_extra\_CV 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 effN\_mult\_Lencomp 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
 effN\_mult\_Agecomp 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
 effN\_mult\_Len-at-age 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

PARAMETERS

Num Value Phase Min Max Init Prior PR\_type SD Active\_Cnt Prior\_Like Bound  
 M-G\_parmsUsing\_offset\_approach#:\_3  
 Gender:\_1\_\_Pattern:\_1  
 1 0.2 -3  
 2 0 -3  
 3 28.1 -2  
 4 60.2 -2  
 5 0.2052 -3  
 6 0.1 -2  
 7 0 -3  
 biology\_parms  
 8 2.44e-006 -3  
 9 3.34694 -3  
 10 28.1 -3  
 11 -0.25 -3  
 12 1 -3  
 13 0 -3  
 recrdist\_by\_growthpattern:1  
 14 0 -3  
 recrdist\_by\_area:1  
 15 0 -3  
 recrdist\_by\_seas:1  
 16 4 -3  
 cohort\_growth\_dev:2  
 17 1 -3  
 MGparm\_env\_linkages  
 MG\_parm\_blockparms  
 M-G\_parm\_devs 1  
 1\_YR1982 0 -

MGParm\_Block\_Assignments

SR\_parms  
 1 10.7263 1 3 31 10.1121 0 -1 99 1 0  
 2 0.941285 1 0.2 1 0.8 0 -1 99 2 0  
 3 0.6 -1  
 4 0 -1  
 5 -0.0527826 1 -5 5 0 0 -1 99 3 0  
 6 0 -1  
 Recr\_Devs  
 1982 0.379281 - - - - - 4  
 1983 0.735238 - - - - - 5

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1984 0.1173 - - - - - 6
1985 0.435202 - - - - - 7
1986 0.535303 - - - - - 8
1987 0.241006 - - - - - 9
1988 -1.05693 - - - - - 10
1989 -0.0828879 - - - - - 11
1990 0.13574 - - - - - 12
1991 -0.0155899 - - - - - 13
1992 0.188584 - - - - - 14
1993 0.0376144 - - - - - 15
1994 0.0357273 - - - - - 16
1995 0.219397 - - - - - 17
1996 -0.159491 - - - - - 18
1997 -0.167965 - - - - - 19
1998 -0.132378 - - - - - 20
1999 -0.402027 - - - - - 21
2000 -0.178327 - - - - - 22
2001 -0.0985194 - - - - - 23
2002 0.0246805 - - - - - 24
2003 -0.299759 - - - - - 25
2004 0.177235 - - - - - 26
2005 -0.381848 - - - - - 27
2006 -0.286584 - - - - - 28
init_F_parms
1 1.69633 1 0 2 1 1 -1 10 29 0
2 0 -1
3 0 -1
4 0 -1
5 0 -1
6 0 -1
Q_parms
sel_parms
#_size_sel:_1
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#_male
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#_male
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#_male
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#_size_sel:_10
#_male
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#_male
#_size_sel:_12
#_male
#_size_sel:_13

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#_male
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#_male
#_size_sel:_15
#_male
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#_male
#_size_sel:_17
#_male
#_size_sel:_18
#_male
#_size_sel:_19
#_male
#_age_sel:_1
1 1.97374 2 0.5 9 4 4 -1 99 30 0
2 -3 -3
3 5.3772e-009 3 0 9 2 2 -1 99 31 0 LO
4 9 -3
5 -999 -2
6 -999 -2
#_male
#_age_sel:_2
7 3.10267 2 0.5 9 4 4 -1 99 32 0
8 -3 -3
9 0.695128 3 0 9 2 2 -1 99 33 0
10 9 -3
11 -999 -2
12 -999 -2
#_male
#_age_sel:_3
13 1.02044 2 0.5 9 4 4 -1 99 34 0
14 2.99968 3 -9 3 -3 -3 -1 99 35 0 HI
15 5.34279e-008 3 0 9 2 2 -1 99 36 0 LO
16 8.92362 3 0 9 9 9 -1 99 37 0 HI
17 -999 -2
18 -9.31547 3 -10 10 0 5 -1 99 38 0
#_male
#_age_sel:_4
19 2.07057 2 0.5 9 4 4 -1 99 39 0
20 -8.99997 3 -9 3 -3 -3 -1 99 40 0 LO
21 0.433328 3 0 9 2 2 -1 99 41 0
22 3.14884e-007 3 0 9 9 9 -1 99 42 0 LO
23 -999 -2
24 -9.99843 3 -10 10 0 5 -1 99 43 0 LO
#_male
#_age_sel:_5
25 1.75411 2 0.5 9 4 4 -1 99 44 0
26 -3 -3
27 1.0821e-008 3 0 9 2 2 -1 99 45 0 LO
28 9 -3
29 -999 -2
30 -999 -2
#_male
#_age_sel:_6
31 1.61042 2 0.5 9 4 4 -1 99 46 0
32 -9 3 -9 3 -3 -3 -1 99 47 0 LO
33 2.06662e-008 3 0 9 2 2 -1 99 48 0 LO

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34 1.21969e-007 3 0 9 9 9 -1 99 49 0 LO
35 -999 -2
36 -9.99952 3 -10 10 0 5 -1 99 50 0 LO
#_male
#_age_sel:_7
37 2.62984 2 0.5 9 4 4 -1 99 51 0
38 -3 -3
39 0.799193 3 0 9 2 2 -1 99 52 0
40 9 -3
41 -999 -2
42 -999 -2
#_male
#_age_sel:_8
43 2.63079 2 0.5 9 4 4 -1 99 53 0
44 -3 -3
45 0.813735 3 0 9 2 2 -1 99 54 0
46 9 -3
47 -999 -2
48 -999 -2
#_male
#_age_sel:_9
49 1.00677 2 0.5 9 4 4 -1 99 55 0
50 -3 -3
51 2.3011e-007 3 0 9 2 2 -1 99 56 0 LO
52 9 -3
53 -999 -2
54 -999 -2
#_male
#_age_sel:_10
55 2.57629 2 0.5 9 4 4 -1 99 57 0
56 -3 -3
57 4.2168e-009 3 0 9 2 2 -1 99 58 0 LO
58 9 -3
59 -999 -2
60 -999 -2
#_male
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61 2.39289 2 0.5 9 4 4 -1 99 59 0
62 -3 -3
63 9.51338e-010 3 0 9 2 2 -1 99 60 0 LO
64 9 -3
65 -999 -2
66 -999 -2
#_male
#_age_sel:_12
67 2.63304 2 0.5 9 4 4 -1 99 61 0
68 -3 -3
69 1.35641e-008 3 0 9 2 2 -1 99 62 0 LO
70 9 -3
71 -999 -2
72 -999 -2
#_male
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73 1.55873 2 0.5 9 4 4 -1 99 63 0
74 -3 -3
75 4.80854e-009 3 0 9 2 2 -1 99 64 0 LO
76 9 -3

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77 -999 -2
78 -999 -2
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79 2.37479 2 0.5 9 4 4 -1 99 65 0
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82 9 -3
83 -999 -2
84 -999 -2
#_male
#_age_sel:_15
85 2.23303 2 0.5 9 4 4 -1 99 67 0
86 -3 -3
87 0.656754 3 0 9 2 2 -1 99 68 0
88 9 -3
89 -999 -2
90 -999 -2
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91 0.999921 2 0.5 9 4 4 -1 99 69 0
92 -3 -3
93 0.206175 3 0 9 2 2 -1 99 70 0
94 9 -3
95 -999 -2
96 -999 -2
#_male
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98 0 -3
#_male
#_age_sel:_18
99 0 -3
100 0 -3
#_male
#_age_sel:_19
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102 0 -3
#_male
sel_parm_env_linkages
sel_parm_blockparms
103 2.65148 2 0.5 9 4 4 -1 99 71 0
104 0.0988482 3 0 9 2 2 -1 99 72 0
105 3.38705 2 0.5 9 4 4 -1 99 73 0
106 0.463316 3 0 9 2 2 -1 99 74 0
107 1.96104 2 0.5 9 4 4 -1 99 75 0
108 0.270113 3 0 9 2 2 -1 99 76 0
109 8.60703 3 0 9 9 9 -1 99 77 0
110 -9.92206 3 -10 10 0 5 -1 99 78 0 LO
111 2.18987 2 0.5 9 4 4 -1 99 79 0
112 6.69745e-008 3 0 9 2 2 -1 99 80 0 LO
113 1.68701e-007 3 0 9 9 9 -1 99 81 0 LO
114 1.10433 3 -10 10 0 5 -1 99 82 0
115 2.86846 2 0.5 9 4 4 -1 99 83 0
116 0.407388 3 0 9 2 2 -1 99 84 0
117 1.60548 2 0.5 9 4 4 -1 99 85 0
118 3.58325e-009 3 0 9 2 2 -1 99 86 0 LO

```

119 1.68123e-008 3 0 9 9 9 -1 99 87 0 LO  
 120 -5.64085 3 -10 10 0 5 -1 99 88 0  
 SEL\_parm\_devs  
 1\_YR1982 0  
 Forecast\_Recr\_Devs  
 2007 0 - - - - - 89

Selex\_Block\_Assignments Years:

Base_parm#	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006		
1	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0	0

RECR\_DIST

G\_pattern gender Seas Area Value Used?  
 1 1 1 1 1

MOVEMENT

Seas Source Dist 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

SUBMORPHDIST 1

MGparm\_By\_Year\_after\_adjustments

Year	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
1982	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0	0	4	1
1983	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0	0	4	1
1984	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0	0	4	1
1985	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0	0	4	1
1986	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0	0	4	1
1987	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0	0	4	1
1988	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0	0	4	1
1989	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0	0	4	1
1990	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0	0	4	1
1991	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0	0	4	1
1992	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0	0	4	1
1993	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0	0	4	1
1994	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0	0	4	1
1995	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0	0	4	1
1996	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0	0	4	1
1997	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0	0	4	1
1998	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0	0	4	1



1999	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0	0	4	1
2000	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0	0	4	1
2001	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0	0	4	1
2002	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0	0	4	1
2003	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0	0	4	1
2004	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0	0	4	1
2005	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0	0	4	1
2006	0.2	0	28.1	60.2	0.2052	0.1	0	2.44e-006	3.34694	28.1	-0.25	1	0	0	0	4	1

SELParm(Size)\_By\_Year\_after\_adjustments  
Fleet/Svy Year

SELParm(Age)\_By\_Year\_after\_adjustments  
Fleet/Svy Year

1	1982	1.97374	-3	5.3772e-009	9	-999	-999										
1	1995	2.65148	-3	0.0988482	9	-999	-999										
2	1982	3.10267	-3	0.695128	9	-999	-999										
2	1995	3.38705	-3	0.463316	9	-999	-999										
3	1982	1.02044	2.99968	5.34279e-008	8.92362	-999	-9.31547										
3	1995	1.96104	2.99968	0.270113	8.60703	-999	-9.92206										
4	1982	2.07057	-8.99997	0.433328	3.14884e-007	-999	-9.99843										
4	1995	2.18987	-8.99997	6.69745e-008	1.68701e-007	-999	1.10433										
5	1982	1.75411	-3	1.0821e-008	9	-999	-999										
5	1995	2.86846	-3	0.407388	9	-999	-999										
6	1982	1.61042	-9	2.06662e-008	1.21969e-007	-999	-9.99952										
6	1995	1.60548	-9	3.58325e-009	1.68123e-008	-999	-5.64085										
7	1982	2.62984	-3	0.799193	9	-999	-999										
8	1982	2.63079	-3	0.813735	9	-999	-999										
9	1982	1.00677	-3	2.3011e-007	9	-999	-999										
10	1982	2.57629	-3	4.2168e-009	9	-999	-999										
11	1982	2.39289	-3	9.51338e-010	9	-999	-999										
12	1982	2.63304	-3	1.35641e-008	9	-999	-999										
13	1982	1.55873	-3	4.80854e-009	9	-999	-999										
14	1982	2.37479	-3	8.68399e-010	9	-999	-999										
15	1982	2.23303	-3	0.656754	9	-999	-999										
16	1982	0.999921	-3	0.206175	9	-999	-999										
17	1982	0	0														
18	1982	0	0														
19	1982	0	0														

EXPLOITATION Hrate\_is\_Continuous\_F Fleet\_in\_columns;\_year\_in\_rows

yr seas 1 2 3 4 5 6

init_yr	1	1.69633	0	0	0	0	0										
1982	1	0.696923	0.520672	0	0	0.651114	0.0215592										
1983	1	0.848389	0.517252	0	0	0.0885099	0.0241223										
1984	1	0.817659	0.813321	0	0	0.505292	0.0228049										
1985	1	0.829448	0.570227	0	0	0.38806	0.00596932										
1986	1	0.902398	0.481583	0	0	0.643524	0.0420524										
1987	1	0.87767	0.423746	0	0	0.40364	0.0348759										
1988	1	1.09054	0.559255	0	0	0.54739	0.0267095										
1989	1	0.860061	0.456393	0.072753	0	0.190601	0.00596043										
1990	1	0.500825	0.366903	0.112288	0	0.331257	0.0323731										
1991	1	0.634453	0.432054	0.0850217	0	0.426588	0.0492399										
1992	1	0.923679	0.316181	0.0563009	0	0.400297	0.0396348										
1993	1	0.600873	0.349938	0.0630537	0	0.456399	0.0955669										
1994	1	0.593916	0.372075	0.0316709	0.0540191	0.436667	0.0675514										
1995	1	1.03891	0.818268	0.0149126	0.0249021	0.555775	0.0706187										

1996 1 0.626286 0.589045 0.0277906 0.0110119 0.746611 0.0466988  
 1997 1 0.329654 0.116107 0.0139905 0.00589162 0.583565 0.030762  
 1998 1 0.289486 0.149022 0.0130693 0.00803391 0.464551 0.0381168  
 1999 1 0.229564 0.113352 0.0530287 0.0190647 0.254777 0.0348294  
 2000 1 0.20546 0.117052 0.0251532 0.00648873 0.454832 0.0476486  
 2001 1 0.212397 0.0927343 0.00969099 0.0117605 0.312372 0.0647091  
 2002 1 0.241676 0.123545 0.0113368 0.00616481 0.190803 0.0351759  
 2003 1 0.20731 0.0896376 0.0140383 0.00305609 0.233258 0.0339814  
 2004 1 0.220803 0.102171 0.00480198 0.00238279 0.181646 0.0380037  
 2005 1 0.199172 0.0740993 0.00392251 0.00232279 0.159754 0.0341463  
 2006 1 0.121588 0.0609425 0.0047057 0.00185252 0.139819 0.0255747  
 2007 1 0.0544083 0.0272707 0.00210571 0.000828969 0.0625663 0.0114442

TIME\_SERIES Bio-Smry\_age:\_1 Hrate\_is\_Continuous\_F  
 pop year period season bio-all bio-smry SpawnBio recruit-0 enc\_catch:\_1  
 dead\_catch:\_1 ret\_catch:\_1 obs\_cat:\_1 Hrate-1 enc\_catch:\_2 dead\_catch:\_2  
 ret\_catch:\_2 obs\_cat:\_2 Hrate-2 enc\_catch:\_3 dead\_catch:\_3 ret\_catch:\_3  
 obs\_cat:\_3 Hrate-3 enc\_catch:\_4 dead\_catch:\_4 ret\_catch:\_4 obs\_cat:\_4 Hrate-4  
 enc\_catch:\_5 dead\_catch:\_5 ret\_catch:\_5 obs\_cat:\_5 Hrate-5 enc\_catch:\_6  
 dead\_catch:\_6 ret\_catch:\_6 obs\_cat:\_6 Hrate-6 SPB\_vir\_LH  
 1 1980 VIRG 1 364568 364258 362975 45538.3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 1 1981 INIT 1 22218.4 21924 20939.8 43197 18393.4 18393.4 18393.4 10000  
 1.69633 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 1 1982 TIME 1 22225.9 21924 20939.8 44297.1 7487.62 7487.62 7487.62 7536  
 0.696923 2842.42 2842.42 2842.42 2864 0.520672 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 8274.41 8274.41 8274.41 8267 0.651114 296.102 296.102 296.102 296 0.0215592 20942.7  
 1 1983 TIME 1 21981.5 21552.7 20457.2 62916.4 10244.7 10244.7 10244.7 10201  
 0.848389 3178.31 3178.31 3178.31 3178.31 3201 0.517252 0 0 0 0 0 0 0 0 0 0 0 0  
 1270.16 1270.16 1268 0.0885099 376.339 376.339 376.339 376 0.0241223 20620.1  
 1 1984 TIME 1 30300 30053.6 28486.6 36151.1 11409 11409 11409 11455 0.817659  
 5646.89 5646.89 5646.89 5674 0.813321 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 8449.2 8449.2 8512 0.505292 414.88 414.88 414.88 415 0.0228049 28580.2  
 1 1985 TIME 1 24233.9 23908.6 22902.2 47725.9 10630.9 10630.9 10630.9 10767  
 0.829448 3879.77 3879.77 3879.77 3907 0.570227 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 5645.71 5645.71 5665 0.38806 92.0003 92.0003 92.0003 92 0.00596932 23025.8  
 1 1986 TIME 1 23502.6 23146.1 21983.1 52311.7 9551 9551 9551 9500 0.902398  
 2685.02 2685.02 2685.02 2687 0.481583 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 8165.61 8165.61 8102 0.643524 578.422 578.422 578.422 578 0.0420524 22118.6  
 1 1987 TIME 1 23165 22900.3 21641.1 38847.8 9958.8 9958.8 9958.8 9945 0.87767  
 2318.16 2318.16 2318.16 2326 0.423746 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 5525.24 5525.24 5519 0.40364 522.148 522.148 522.148 522 0.0348759 21741.8  
 1 1988 TIME 1 22870.9 22798.5 21764.2 10621.7 11374 11374 11374 11616 1.09054  
 3025.39 3025.39 3025.39 3071 0.559255 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 6566.64 6566.64 6634 0.54739 340.946 340.946 340.946 341 0.0267095 21791.7  
 1 1989 TIME 1 11840.9 11680.2 11322.3 23587 5937.23 5937.23 5937.23 6218  
 0.860061 1870.08 1870.08 1870.08 1870.08 1908 0.456393 706.675 706.675 706.675 709  
 0.072753 0 0 0 0 0 1420.73 1420.73 1420.73 1435 0.190601 44.9895 44.9895  
 44.9895 45 0.00596043 11383.4  
 1 1990 TIME 1 10872.7 10680.2 10143 28244.9 2874.63 2874.63 2874.63 2962  
 0.500825 1223.39 1223.39 1223.39 1237 0.366903 1202.58 1202.58 1202.58 1214  
 0.112288 0 0 0 0 0 2276.96 2276.96 2276.96 2329 0.331257 233.481 233.481  
 233.481 234 0.0323731 10216.1  
 1 1991 TIME 1 13738.1 13558.9 12874.7 26297 4444.85 4444.85 4444.85 4629  
 0.634453 1559.88 1559.88 1559.88 1595 0.432054 1048.74 1048.74 1048.74 1052  
 0.0850217 0 0 0 0 0 3525.65 3525.65 3525.65 3611 0.426588 428.098 428.098  
 428.098 429 0.0492399 12942.8

1 1992 TIME 1 13982.4 13761.4 13109.2 32432.6 6421.61 6421.61 6421.61 6361  
0.923679 1165.14 1165.14 1165.14 1168 0.316181 690.297 690.297 690.297 690  
0.0563009 0 0 0 0 3256.47 3256.47 3256.47 3242 0.400297 344.327 344.327  
344.327 344 0.0396348 13193.2  
1 1993 TIME 1 14630.2 14437.7 13667.8 28239.9 4429.92 4429.92 4429.92 4401  
0.600873 1315.19 1315.19 1315.19 1313 0.349938 846.109 846.109 846.109 846  
0.0630537 0 0 0 0 4024.85 4024.85 4024.85 4006 0.456399 910.873 910.873  
910.873 910 0.0955669 13741  
1 1994 TIME 1 15312.6 15117.6 14405.9 28620.9 4831.99 4831.99 4831.99 4969  
0.593916 1602.32 1602.32 1602.32 1620 0.372075 432.968 432.968 432.968 434  
0.0316709 470.805 470.805 470.805 472 0.0540191 4115.93 4115.93 4115.93 4231  
0.436667 675.127 675.127 675.127 678 0.0675514 14480  
1 1995 TIME 1 15441.5 15206.7 14493.8 34451 4618.35 4618.35 4618.35 4911  
1.03891 1989.27 1989.27 1989.27 2066 0.818268 137.946 137.946 137.946 138  
0.0149126 169.778 169.778 169.778 170 0.0249021 2377.31 2377.31 2377.31 2450  
0.555775 752.71 752.71 752.71 752 0.0706187 14583.1  
1 1996 TIME 1 19639.1 19467.8 18540.4 25144.7 3972.01 3972.01 3972.01 3947  
0.626286 1887.08 1887.08 1887.08 1913 0.589045 356.228 356.228 356.228 355  
0.0277906 108.079 108.079 108.079 108 0.0110119 4482.93 4482.93 4482.93 4454  
0.746611 687.058 687.058 687.058 681 0.0466988 18605.5  
1 1997 TIME 1 22083 21908.1 21128 25677 3453.51 3453.51 3453.51 3313 0.329654  
683.671 683.671 683.671 681 0.116107 239.686 239.686 239.686 239 0.0139905  
86.1012 86.1012 86.1012 86 0.00589162 5730.52 5730.52 5730.52 5382 0.583565  
559.89 559.89 559.89 556 0.030762 21194.5  
1 1998 TIME 1 25298.3 25111.7 24367.8 27386.1 3850.64 3850.64 3850.64 3730  
0.289486 1362.49 1362.49 1362.49 1346 0.149022 254.369 254.369 254.369 254  
0.0130693 135.134 135.134 135.134 135 0.00803391 5941.88 5941.88 5941.88 5659  
0.464551 737.042 737.042 737.042 734 0.0381168 24438.7  
1 1999 TIME 1 27486.3 27341.5 26554.1 21247.3 3619.57 3619.57 3619.57 3551  
0.229564 1280.91 1280.91 1280.91 1271 0.113352 1185.7 1185.7 1185.7 1181  
0.0530287 367.592 367.592 367.592 367 0.0190647 3872.97 3872.97 3872.97 3795  
0.254777 711.987 711.987 711.987 711 0.0348294 26609.1  
1 2000 TIME 1 29967.2 29783.2 29116.4 26996.8 3623.82 3623.82 3623.82 3564  
0.20546 1533.45 1533.45 1533.45 1521 0.117052 593.186 593.186 593.186 592  
0.0251532 134.069 134.069 134.069 134 0.00648873 7742.29 7742.29 7742.29 7470  
0.454832 953.742 953.742 953.742 952 0.0476486 29186.3  
1 2001 TIME 1 29599 29400.3 28655.3 29162.3 3748.99 3748.99 3748.99 3705  
0.212397 1271.92 1271.92 1271.92 1265 0.0927343 230.136 230.136 230.136 230  
0.00969099 238.136 238.136 238.136 238 0.0117605 5374.75 5374.75 5374.75 5279  
0.312372 1276.56 1276.56 1276.56 1274 0.0647091 28730.9  
1 2002 TIME 1 32516.2 32288 31451.9 33483.4 4801.1 4801.1 4801.1 4723  
0.241676 1855.63 1855.63 1855.63 1850 0.123545 307.362 307.362 307.362 307  
0.0113368 142.086 142.086 142.086 142 0.00616481 3672.73 3672.73 3672.73 3632  
0.190803 779.312 779.312 779.312 777 0.0351759 31538.6  
1 2003 TIME 1 37943.5 37774.7 36819.8 24764.3 4897.01 4897.01 4897.01 4835  
0.20731 1618 1618 1618 1614 0.0896376 445.61 445.61 445.61 445 0.0140383  
83.0236 83.0236 83.0236 83 0.00305609 5348.77 5348.77 5348.77 5279 0.233258  
885.836 885.836 885.836 882 0.0339814 36884  
1 2004 TIME 1 41067.1 40792.2 39994.5 40333.2 6118.7 6118.7 6118.7 6036  
0.220803 2196.4 2196.4 2196.4 2193 0.102171 170.076 170.076 170.076 170  
0.00480198 74.0182 74.0182 74.0182 74 0.00238279 4877.39 4877.39 4877.39 4831  
0.181646 1039.13 1039.13 1039.13 1034 0.0380037 40098.9  
1 2005 TIME 1 45927.9 45768.7 44695.8 23368.8 6053.35 6053.35 6053.35 5984  
0.199172 1847.05 1847.05 1847.05 1841 0.0740993 153.024 153.024 153.024 153  
0.00392251 77.011 77.011 77.011 77 0.00232279 4765.4 4765.4 4765.4 4724  
0.159754 1000.34 1000.34 1000.34 999 0.0341463 44756.3

1 2006 TIME 1 49313.5 49136.8 48312.5 25925.7 4479.09 4479.09 4479.09 4481  
0.121588 1780.44 1780.44 1780.44 1781 0.0609425 214 214 214 214 0.0047057 74  
74 74 74 0.00185252 4989.39 4989.39 4989.39 4992 0.139819 795.14 795.14  
795.14 795 0.0255747 48379.7  
1 2007 FORE 1 53899 53614.6 52970.8 41729.8 2447.68 2447.68 2447.68 2447.68  
0.0544083 1063.17 1063.17 1063.17 1063.17 0.0272707 109.781 109.781 109.781  
109.781 0.00210571 37.6537 37.6537 37.6537 37.6537 0.000828969 2773.31  
2773.31 2773.31 2773.31 0.0625663 374.512 374.512 374.512 374.512 0.0114442  
52970.8

SPR\_series uses\_R0= 45538.3 ###note\_Y/R\_unit\_is\_Dead\_Biomass  
Year Bio\_all Bio\_Smry SPBzero SPBfished SPBfished/R SPR Y/R GenTime Actual:  
Bio\_all Bio\_Smry Enc\_Catch Dead\_Catch Retain\_Catch SPB Recruits Tot\_Exploit  
More\_F(by\_morph): aveF-1 maxF-1  
1982 22428.8 22118.5 362975 21108.5 0.463533 0.0581542 0.417203 0.130061 +  
22225.9 21924 18900.6 18900.6 18900.6 20939.8 44297.1 0.850384 + 1.77013  
1.88487  
1983 28903.3 28592.9 362975 27503.9 0.603974 0.0757737 0.457077 0.195501 +  
21981.5 21552.7 15069.5 15069.5 15069.5 20457.2 62916.4 0.685554 + 1.36853  
1.47254  
1984 22037.6 21727.3 362975 20714.8 0.454888 0.0570696 0.416716 0.0998648 +  
30300 30053.6 25920 25920 25920 28486.6 36151.1 0.855446 + 2.01001 2.15218  
1985 24377.7 24067.4 362975 23026.6 0.505654 0.0634386 0.430905 0.140805 +  
24233.9 23908.6 20248.4 20248.4 20248.4 22902.2 47725.9 0.835542 + 1.6846  
1.79026  
1986 20866 20555.6 362975 19565.6 0.429653 0.0539036 0.407294 0.111259 +  
23502.6 23146.1 20980.1 20980.1 20980.1 21983.1 52311.7 0.89267 + 1.92717  
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INDEX\_2

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12 2003 28506 1.643 0.653274 2.2917e-005 0.4 0.922282 2.65814 1.74185  
12 2004 32408.1 1.422 0.742698 2.2917e-005 0.4 0.64953 1.3184 0.402112  
12 2005 33027 0.447 0.75688 2.2917e-005 0.4 -0.526647 0.866739 -0.0495514  
12 2006 38327.9 0.493 0.878363 2.2917e-005 0.4 -0.57755 1.04239 0.126098  
13 1984 61567.4 0.999 2.2034 3.57884e-005 0.4 -0.791002 1.95526 1.03897  
13 1985 47866.9 1.191 1.71308 3.57884e-005 0.4 -0.363499 0.41291 -0.503381  
13 1986 48613.9 1.719 1.73982 3.57884e-005 0.4 -0.0120363 0.000452728 -  
0.915838  
13 1987 48987 1.401 1.75317 3.57884e-005 0.4 -0.224238 0.157133 -0.759158  
13 1988 43465.7 1.42 1.55557 3.57884e-005 0.4 -0.0911844 0.0259831 -0.890308  
13 1989 21422.4 0.14 0.766675 3.57884e-005 0.4 -1.70042 9.03571 8.11942  
13 1990 22336.3 0.87 0.799379 3.57884e-005 0.4 0.0846577 0.0223967 -0.893894  
13 1991 28195 1.26 1.00905 3.57884e-005 0.4 0.222098 0.154149 -0.762142



13 1992 28657.4 1.02 1.0256 3.57884e-005 0.4 -0.00547884 9.38051e-005 -  
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13 1993 30691.7 1.109 1.09841 3.57884e-005 0.4 0.00959785 0.000287871 -  
0.916003  
13 1994 30887.5 0.55 1.10541 3.57884e-005 0.4 -0.698056 1.52276 0.606466  
13 1995 31294.1 0.541 1.11996 3.57884e-005 0.4 -0.727633 1.65453 0.738238  
13 1996 39203.4 2.191 1.40303 3.57884e-005 0.4 0.445726 0.62085 -0.295441  
13 1997 40070.3 2.5 1.43405 3.57884e-005 0.4 0.555788 0.965312 0.049021  
13 1998 41633.3 1.719 1.48999 3.57884e-005 0.4 0.142974 0.06388 -0.852411  
13 1999 43212.2 2.68 1.5465 3.57884e-005 0.4 0.549825 0.944711 0.0284203  
13 2000 43490.1 1.91 1.55644 3.57884e-005 0.4 0.2047 0.130945 -0.785346  
13 2001 43493.2 4.417 1.55655 3.57884e-005 0.4 1.04299 3.39944 2.48315  
13 2002 48226.2 6.121 1.72594 3.57884e-005 0.4 1.26595 5.00825 4.09196  
13 2003 54687.7 3.388 1.95719 3.57884e-005 0.4 0.548732 0.940959 0.0246685  
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14 1985 24818.2 0.3 0.609268 2.45492e-005 0.4 -0.708476 1.56856 0.652267  
14 1986 20742.4 0.64 0.50921 2.45492e-005 0.4 0.228608 0.163317 -0.752973  
14 1987 20350.5 0.39 0.499588 2.45492e-005 0.4 -0.247638 0.191639 -0.724652  
14 1988 22580.5 0.24 0.554333 2.45492e-005 0.4 -0.837127 2.18994 1.27365  
14 1989 13201.1 0.07 0.324076 2.45492e-005 0.4 -1.53248 7.33908 6.42279  
14 1990 8844.48 0.12 0.217125 2.45492e-005 0.4 -0.592982 1.09884 0.182546  
14 1991 12337.4 0.09 0.302873 2.45492e-005 0.4 -1.2135 4.60185 3.68556  
14 1992 13057.1 0.52 0.320542 2.45492e-005 0.4 0.483815 0.731491 -0.1848  
14 1993 12755.7 0.29 0.313143 2.45492e-005 0.4 -0.0767784 0.0184216 -0.897869  
14 1994 14512.6 0.03 0.356274 2.45492e-005 0.4 -2.4745 19.1349 18.2186  
14 1995 14256.5 0.2 0.349986 2.45492e-005 0.4 -0.559575 0.978514 0.062223  
14 1996 18988.7 1.04 0.466158 2.45492e-005 0.4 0.802451 2.01227 1.09598  
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14 1999 26474 2.26 0.649916 2.45492e-005 0.4 1.24628 4.85377 3.93748  
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14 2001 26636.1 0.93 0.653896 2.45492e-005 0.4 0.352236 0.387719 -0.528572  
14 2002 29518 1.78 0.724644 2.45492e-005 0.4 0.898688 2.52388 1.60759  
14 2003 34396.4 2.57 0.844405 2.45492e-005 0.4 1.11303 3.87135 2.95506  
14 2004 38302.6 2.08 0.940299 2.45492e-005 0.4 0.793926 1.96974 1.05345  
14 2005 38853.2 2.07 0.953815 2.45492e-005 0.4 0.774834 1.87615 0.95986  
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15 1991 21651.9 0.15 0.459463 2.12204e-005 0.4 -1.11942 3.91597 2.99968  
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15 1995 24446.4 0.08 0.518764 2.12204e-005 0.4 -1.86942 10.9211 10.0048  
15 1996 30756.5 0.96 0.652666 2.12204e-005 0.4 0.385869 0.465295 -0.450995  
15 1997 33582.1 0.73 0.712628 2.12204e-005 0.4 0.0240849 0.00181275 -0.914478  
15 1998 35091 0.43 0.744647 2.12204e-005 0.4 -0.549126 0.942309 0.0260182  
15 1999 36348.9 0.9 0.771339 2.12204e-005 0.4 0.154267 0.0743696 -0.841921  
15 2000 37914.1 2.61 0.804555 2.12204e-005 0.4 1.17682 4.3278 3.41151  
15 2001 36696.6 0.98 0.778718 2.12204e-005 0.4 0.229904 0.165174 -0.751117  
15 2002 40790.8 2.03 0.865599 2.12204e-005 0.4 0.85237 2.27042 1.35413  
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15 2004 49468 2.17 1.04973 2.12204e-005 0.4 0.726191 1.64798 0.731687  
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16 1988 55412.2 4.26 7.10597 0.000128238 0.4 -0.511666 0.818132 -0.0981583  
16 1989 32012.7 1.69 4.10526 0.000128238 0.4 -0.88754 2.46165 1.54536  
16 1990 37262.7 2.86 4.7785 0.000128238 0.4 -0.513305 0.823382 -0.0929085  
16 1991 43313.5 3.97 5.55445 0.000128238 0.4 -0.335834 0.352452 -0.563839  
16 1992 45561.4 4.75 5.84272 0.000128238 0.4 -0.207052 0.13397 -0.782321  
16 1993 47408.7 8.46 6.07961 0.000128238 0.4 0.330408 0.341155 -0.575136  
16 1994 46860.1 2.83 6.00926 0.000128238 0.4 -0.753025 1.77202 0.855732  
16 1995 49478.8 8.37 6.34508 0.000128238 0.4 0.276974 0.239733 -0.676557  
16 1996 55615 9.69 7.13197 0.000128238 0.4 0.306507 0.293584 -0.622707  
16 1997 54660.6 16.35 7.00959 0.000128238 0.4 0.846949 2.24163 1.32534  
16 1998 56964.5 9.47 7.30502 0.000128238 0.4 0.259567 0.210546 -0.705745  
16 1999 56735.3 11.44 7.27564 0.000128238 0.4 0.452584 0.640101 -0.27619  
16 2000 57713 7.35 7.40101 0.000128238 0.4 -0.00691646 0.000149492 -0.916141  
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16 2004 75874.3 10.66 9.73 0.000128238 0.4 0.0912849 0.0260404 -0.89025  
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17 1982 44297.1 2.27 1.40076 3.1622e-005 0.4 0.482763 0.728314 -0.187977  
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17 1984 36151.1 1.58 1.14317 3.1622e-005 0.4 0.323621 0.327283 -0.589008  
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17 1986 52311.7 1.26 1.6542 3.1622e-005 0.4 -0.272204 0.231547 -0.684744  
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17 1988 10621.7 0.54 0.335879 3.1622e-005 0.4 0.474818 0.704536 -0.211754  
17 1989 23587 1.24 0.745869 3.1622e-005 0.4 0.508317 0.807457 -0.108834  
17 1990 28244.9 2.54 0.893158 3.1622e-005 0.4 1.04516 3.4136 2.49731  
17 1991 26297 2.64 0.831562 3.1622e-005 0.4 1.15523 4.17048 3.25418  
17 1992 32432.6 0.89 1.02558 3.1622e-005 0.4 -0.141795 0.0628311 -0.85346  
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17 1994 28620.9 2.41 0.905048 3.1622e-005 0.4 0.979394 2.99754 2.08125  
17 1995 34451 0.63 1.08941 3.1622e-005 0.4 -0.54767 0.937321 0.0210301  
17 1996 25144.7 0.81 0.795126 3.1622e-005 0.4 0.0185334 0.0010734 -0.915217  
17 1997 25677 0.89 0.811956 3.1622e-005 0.4 0.0917754 0.026321 -0.88997  
17 1998 27386.1 0.73 0.866003 3.1622e-005 0.4 -0.170844 0.0912115 -0.825079  
17 1999 21247.3 0.53 0.671883 3.1622e-005 0.4 -0.237207 0.175835 -0.740456  
17 2000 26996.8 0.57 0.853693 3.1622e-005 0.4 -0.403935 0.509886 -0.406405  
17 2001 29162.3 0.47 0.92217 3.1622e-005 0.4 -0.673997 1.4196 0.503308  
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18 1982 44297.1 3.408 11.863 0.000267804 0.4 -1.24729 4.8617 3.94541  
18 1983 62916.4 17.699 16.8493 0.000267804 0.4 0.0492002 0.00756457 -0.908726  
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18 1985 47725.9 12.843 12.7812 0.000267804 0.4 0.00482508 7.27545e-005 -  
0.916218  
18 1986 52311.7 59.526 14.0093 0.000267804 0.4 1.44669 6.54038 5.62409  
18 1987 38847.8 7.584 10.4036 0.000267804 0.4 -0.316111 0.31227 -0.604021  
18 1988 10621.7 1.763 2.84454 0.000267804 0.4 -0.478383 0.715158 -0.201132  
18 1989 23587 2.855 6.31671 0.000267804 0.4 -0.794126 1.97074 1.05445  
18 1990 28244.9 4.733 7.56409 0.000267804 0.4 -0.468853 0.686946 -0.229345

18	1991	26297	7.337	7.04244	0.000267804	0.4	0.0409754	0.00524682	-0.911044
18	1992	32432.6	8.487	8.68559	0.000267804	0.4	-0.02313	0.00167187	-0.914619
18	1993	28239.9	4.145	7.56276	0.000267804	0.4	-0.601333	1.13	0.213713
18	1994	28620.9	22.311	7.66479	0.000267804	0.4	1.06844	3.56741	2.65112
18	1995	34451	13.067	9.22612	0.000267804	0.4	0.348051	0.378562	-0.537729
18	1996	25144.7	6.493	6.73387	0.000267804	0.4	-0.0364248	0.00414615	-0.912145
18	1997	25677	7.997	6.8764	0.000267804	0.4	0.150972	0.0712265	-0.845064
18	1998	27386.1	14.983	7.33412	0.000267804	0.4	0.714379	1.5948	0.678513
18	1999	21247.3	8.565	5.69013	0.000267804	0.4	0.408951	0.522629	-0.393662
18	2000	26996.8	9.874	7.22986	0.000267804	0.4	0.311685	0.303586	-0.612705
18	2001	29162.3	13.543	7.80979	0.000267804	0.4	0.550492	0.947003	0.0307125
18	2002	33483.4	5.406	8.96699	0.000267804	0.4	-0.50604	0.80024	-0.11605
18	2003	24764.3	8.18	6.63197	0.000267804	0.4	0.20979	0.137538	-0.778753
18	2004	40333.2	6.993	10.8014	0.000267804	0.4	-0.434766	0.590692	-0.325599
18	2005	23368.8	2.198	6.25826	0.000267804	0.4	-1.04635	3.42143	2.50514
18	2006	25925.7	9.658	6.94301	0.000267804	0.4	0.330051	0.340418	-0.575873
19	1986	52311.7	0.32	0.313775	5.99819e-006	0.4	0.0196445	0.00120595	-0.915085
19	1987	38847.8	0.26	0.233016	5.99819e-006	0.4	0.109573	0.0375193	-0.878771
19	1988	10621.7	0.01	0.063711	5.99819e-006	0.4	-1.85177	10.7158	9.79952
19	1989	23587	0.14	0.14148	5.99819e-006	0.4	-0.0105125	0.000345351	-0.915945
19	1990	28244.9	0.36	0.169418	5.99819e-006	0.4	0.753735	1.77537	0.859075
19	1991	26297	0.38	0.157734	5.99819e-006	0.4	0.87926	2.41593	1.49964
19	1992	32432.6	0.37	0.194537	5.99819e-006	0.4	0.642881	1.29155	0.375258
19	1993	28239.9	0.05	0.169388	5.99819e-006	0.4	-1.22017	4.65254	3.73625
19	1994	28620.9	0.57	0.171673	5.99819e-006	0.4	1.20004	4.50032	3.58403
19	1995	34451	0.3	0.206644	5.99819e-006	0.4	0.372787	0.434282	-0.482009
19	1996	25144.7	0.08	0.150823	5.99819e-006	0.4	-0.63408	1.25643	0.340137
19	1997	25677	0.22	0.154015	5.99819e-006	0.4	0.356576	0.397333	-0.518958
19	1998	27386.1	0.39	0.164267	5.99819e-006	0.4	0.864653	2.33633	1.42004
19	1999	21247.3	0.35	0.127446	5.99819e-006	0.4	1.01024	3.18935	2.27306
19	2000	26996.8	0.21	0.161932	5.99819e-006	0.4	0.259931	0.211138	-0.705153
19	2001	29162.3	0.14	0.174921	5.99819e-006	0.4	-0.222692	0.154975	-0.761316
19	2002	33483.4	0.13	0.20084	5.99819e-006	0.4	-0.434972	0.591252	-0.325038
19	2003	24764.3	0.21	0.148541	5.99819e-006	0.4	0.346249	0.374651	-0.541639
19	2004	40333.2	0.27	0.241926	5.99819e-006	0.4	0.10979	0.0376681	-0.878623
19	2005	23368.8	0.01	0.14017	5.99819e-006	0.4	-2.64027	21.7845	20.8682
19	2006	25925.7	0.17	0.155507	5.99819e-006	0.4	0.0891063	0.0248123	-0.891478

#### INDEX\_1

Index	Do_Power	Power	Do_Env_var	Env_Link	Do_ExtraVar	Qtype	Q	Num=0/Bio=1	Err_type	N	Npos	r.m.s.e.	mean_input_SE	mean_(Input+extra)_SE	pen_mean_Qdev	rmse_Qdev
1	0	1.0	0	0.00	0.0	0	--	1	0	0	0	0	0	0	0	0
2	0	1.0	0	0.00	0.0	0	--	1	0	0	0	0	0	0	0	0
3	0	1.0	0	0.00	0.0	0	--	1	0	0	0	0	0	0	0	0
4	0	1.0	0	0.00	0.0	0	--	1	0	0	0	0	0	0	0	0
5	0	1.0	0	0.00	0.0	0	--	1	0	0	0	0	0	0	0	0
6	0	1.0	0	0.00	0.0	0	--	1	0	0	0	0	0	0	0	0
7	0	1.0	0	0.00	0.0	0	0.000540955	0	0	15	15	0.420682	0.16	0.16	0	0
8	0	1.0	0	0.00	0.0	0	5.29245e-005	0	0	25	25	0.406955	0.21	0.21	0	0
9	0	1.0	0	0.00	0.0	0	3.57563e-005	0	0	25	25	0.454752	0.31	0.31	0	0
10	0	1.0	0	0.00	0.0	0	5.08453e-005	0	0	25	25	0.779939	0.21	0.21	0	0
11	0	1.0	0	0.00	0.0	0	3.51898e-005	0	0	25	25	0.956204	0.21	0.21	0	0
12	0	1.0	0	0.00	0.0	0	2.2917e-005	0	0	23	23	0.728863	0.4	0.4	0	0
13	0	1.0	0	0.00	0.0	0	3.57884e-005	0	0	23	23	0.622706	0.4	0.4	0	0
14	0	1.0	0	0.00	0.0	0	2.45492e-005	0	0	25	25	0.873332	0.4	0.4	0	0
15	0	1.0	0	0.00	0.0	0	2.12204e-005	0	0	17	17	0.846791	0.4	0.4	0	0

```

16 0 1.0 0 0.00 0.0 0 0.000128238 0 0 19 19 0.452521 0.4 0.4 0 0
17 0 1.0 0 0.00 0.0 0 3.1622e-005 0 0 25 25 0.594813 0.4 0.4 0 0
18 0 1.0 0 0.00 0.0 0 0.000267804 0 0 25 25 0.611653 0.4 0.4 0 0
19 0 1.0 0 0.00 0.0 0 5.99819e-006 0 0 21 21 0.925271 0.4 0.4 0 0

```

rmse\_Qdev\_not\_in\_logL

pen\_mean\_Qdev\_not\_in\_logL\_in\_randwalk\_approach

INDEX\_3

Index Q\_parm\_assignments

```

1 0 -- 0 -- 0 0
2 0 -- 0 -- 0 0
3 0 -- 0 -- 0 0
4 0 -- 0 -- 0 0
5 0 -- 0 -- 0 0
6 0 -- 0 -- 0 0
7 0 -- 0 -- 0 0
8 0 -- 0 -- 0 0
9 0 -- 0 -- 0 0
10 0 -- 0 -- 0 0
11 0 -- 0 -- 0 0
12 0 -- 0 -- 0 0
13 0 -- 0 -- 0 0
14 0 -- 0 -- 0 0
15 0 -- 0 -- 0 0
16 0 -- 0 -- 0 0
17 0 -- 0 -- 0 0
18 0 -- 0 -- 0 0
19 0 -- 0 -- 0 0

```

DISCARD log(L)\_based\_on\_T-distribution\_with\_DF=\_30  
as\_fraction

index year seas obs exp cv Dev Like Like+log(s)

MEAN\_BODY\_WT log(L)\_based\_on\_T-distribution\_with\_DF=\_30

year seas index Mkt obs exp cv Dev Like Like+log(s)

```

1982 1 1 0 0.504 0.612363 0.1 -0.108363 2.22137 2.22137
1983 1 1 0 0.521 0.610247 0.1 -0.0892473 1.44645 1.44645
1984 1 1 0 0.518 0.599941 0.1 -0.0819413 1.24178 1.24178
1985 1 1 0 0.575 0.655972 0.1 -0.0809724 0.992146 0.992146
1986 1 1 0 0.613 0.602498 0.1 0.010502 0.0151573 0.0151573
1987 1 1 0 0.581 0.592906 0.1 -0.0119064 0.0216828 0.0216828
1988 1 1 0 0.588 0.64301 0.1 -0.05501 0.445738 0.445738
1989 1 1 0 0.668 0.735088 0.1 -0.0670882 0.512566 0.512566
1990 1 1 0 0.54 0.63509 0.1 -0.0950898 1.5246 1.5246
1991 1 1 0 0.537 0.624971 0.1 -0.0879709 1.32801 1.32801
1992 1 1 0 0.595 0.629074 0.1 -0.0340744 0.168527 0.168527
1993 1 1 0 0.571 0.609911 0.1 -0.0389107 0.238088 0.238088
1994 1 1 0 0.605 0.643092 0.1 -0.038092 0.203476 0.203476
1995 1 1 0 0.675 0.758197 0.1 -0.0831971 0.765681 0.765681
1996 1 1 0 0.621 0.755434 0.1 -0.134434 2.24981 2.24981
1997 1 1 0 0.697 0.840488 0.1 -0.143488 2.04817 2.04817
1998 1 1 0 0.759 0.945693 0.1 -0.186693 2.84759 2.84759
1999 1 1 0 0.755 0.996752 0.1 -0.241752 4.55675 4.55675
2000 1 1 0 0.85 1.04868 0.1 -0.198685 2.59336 2.59336
2001 1 1 0 0.903 1.09022 0.1 -0.187221 2.07559 2.07559
2002 1 1 0 0.898 1.08023 0.1 -0.182231 1.99375 1.99375

```

2003	1	1	0	0.999	1.09046	0.1	-0.0914585	0.427101	0.427101
2004	1	1	0	0.983	1.12325	0.1	-0.14025	1.01759	1.01759
2005	1	1	0	0.949	1.17917	0.1	-0.230173	2.77539	2.77539
2006	1	1	0	0.947	1.18552	0.1	-0.238523	2.97338	2.97338

FIT\_LEN\_COMPS

Index Year Seas Gender Mkt Nsamp effN Like

index	N	Npos	mean_effN	mean(inputN)	HarMean(effN)	Mean(effN/inputN)	MeaneffN/MeaninputN
1	0	0	0	0	0	0	-1.#IND
2	0	0	0	0	0	0	-1.#IND
3	0	0	0	0	0	0	-1.#IND
4	0	0	0	0	0	0	-1.#IND
5	0	0	0	0	0	0	-1.#IND
6	0	0	0	0	0	0	-1.#IND
7	0	0	0	0	0	0	-1.#IND
8	0	0	0	0	0	0	-1.#IND
9	0	0	0	0	0	0	-1.#IND
10	0	0	0	0	0	0	-1.#IND
11	0	0	0	0	0	0	-1.#IND
12	0	0	0	0	0	0	-1.#IND
13	0	0	0	0	0	0	-1.#IND
14	0	0	0	0	0	0	-1.#IND
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16	0	0	0	0	0	0	-1.#IND
17	0	0	0	0	0	0	-1.#IND
18	0	0	0	0	0	0	-1.#IND
19	0	0	0	0	0	0	-1.#IND

FIT\_AGE\_COMPS

Index Year Seas Gender Mkt Ageerr Lbin\_lo Lbin\_hi Nsamp effN Like

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1	1983	1	0	0	1	1	70	200	18.1541	12.7422
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1	1986	1	0	0	1	1	70	200	17.2752	15.2438
1	1987	1	0	0	1	1	70	200	32.8046	7.88321
1	1988	1	0	0	1	1	70	200	1405	1.92141
1	1989	1	0	0	1	1	70	200	167.564	5.4684
1	1990	1	0	0	1	1	70	200	576.416	0.872547
1	1991	1	0	0	1	1	70	200	52.384	2.0233
1	1992	1	0	0	1	1	70	200	53.1101	9.20428
1	1993	1	0	0	1	1	70	200	144.595	6.31613
1	1994	1	0	0	1	1	70	200	119.826	4.70352
1	1995	1	0	0	1	1	70	200	51.9234	10.1064
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1	1997	1	0	0	1	1	70	200	13.4072	29.1135
1	1998	1	0	0	1	1	70	200	16.7415	21.6081
1	1999	1	0	0	1	1	70	200	24.2913	19.1481
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1	2001	1	0	0	1	1	70	200	62.9992	7.98905
1	2002	1	0	0	1	1	70	200	79.9802	5.41049
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2	1984	1	0	0	1	1	70	200	28.5027	14.5649
2	1985	1	0	0	1	1	70	200	16.4207	15.0521
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2	1988	1	0	0	1	1	70	200	12.4771	16.5247
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2	1990	1	0	0	1	1	70	200	5.57055	55.7759
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2	1993	1	0	0	1	1	70	200	13.3532	11.7807
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2	2003	1	0	0	1	1	70	200	51.4248	8.25974
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3	1992	1	0	0	1	1	70	200	22.2457	25.6397
3	1993	1	0	0	1	1	70	200	55.2122	10.1551
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3	1995	1	0	0	1	1	70	200	9.8161	38.1155
3	1996	1	0	0	1	1	70	200	27.1249	10.9949
3	1997	1	0	0	1	1	70	200	35.5644	7.10751
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3	2003	1	0	0	1	1	70	200	34.0283	14.4182
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3	2006	1	0	0	1	1	70	200	439.43	4.84659
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9	1992	1	0	0	1	1	70	100	18.537	8.07536
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10	1987	1	0	0	1	1	70	100	9.16066	8.08937
10	1988	1	0	0	1	1	70	100	69.4141	0.785839
10	1989	1	0	0	1	1	70	100	918.89	0.0534227
10	1990	1	0	0	1	1	70	100	1.39423	35.3865
10	1991	1	0	0	1	1	70	100	129.869	0.366079
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10	2002	1	0	0	1	1	70	100	3.84199	14.0645
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10	2004	1	0	0	1	1	70	100	359.862	0.138972
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10	2006	1	0	0	1	1	70	100	5.33063	9.68156
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11	1987	1	0	0	1	1	70	100	12.3526	6.04738
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11	1991	1	0	0	1	1	70	100	9.62966	7.6743
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11	1994	1	0	0	1	1	70	100	2.765	44.7066
11	1995	1	0	0	1	1	70	100	2.33909	53.4097
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11	1997	1	0	0	1	1	70	100	593.25	0.082214
11	1998	1	0	0	1	1	70	100	70.8331	0.723779
11	1999	1	0	0	1	1	70	100	32.9585	1.57496
11	2000	1	0	0	1	1	70	100	4.17665	13.3418
11	2001	1	0	0	1	1	70	100	4.19091	12.7937
11	2002	1	0	0	1	1	70	100	3.00967	19.5698
11	2003	1	0	0	1	1	70	100	3.69772	15.1233
11	2004	1	0	0	1	1	70	100	1.85329	32.4731
11	2005	1	0	0	1	1	70	100	13.929	3.59318
11	2006	1	0	0	1	1	70	100	2.43052	23.6282
12	1984	1	0	0	1	1	70	100	54.4773	0.993404
12	1985	1	0	0	1	1	70	100	12.3091	15.987
12	1986	1	0	0	1	1	70	100	4.83604	10.2043
12	1987	1	0	0	1	1	70	100	180.86	0.353807
12	1988	1	0	0	1	1	70	100	576.741	0.653005
12	1989	1	0	0	1	1	70	100	4.2191	25.9059
12	1990	1	0	0	1	1	70	100	44.1905	5.10948

12	1991	1	0	0	1	1	70	100	53.0359	1.71795
12	1992	1	0	0	1	1	70	100	24.9954	2.59058
12	1993	1	0	0	1	1	70	100	26.4658	7.33133
12	1994	1	0	0	1	1	70	100	26.5058	3.70345
12	1995	1	0	0	1	1	70	100	31.0605	2.51229
12	1996	1	0	0	1	1	70	100	9.02059	8.181
12	1997	1	0	0	1	1	70	100	17.7548	8.64858
12	1998	1	0	0	1	1	70	100	78.3576	1.71525
12	1999	1	0	0	1	1	70	100	420.187	0.217204
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12	2005	1	0	0	1	1	70	100	8.74476	13.5448
12	2006	1	0	0	1	1	70	100	6.61996	13.1931
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13	1985	1	0	0	1	1	70	100	17.8443	9.46712
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13	1987	1	0	0	1	1	70	100	13.7063	5.76295
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13	1992	1	0	0	1	1	70	100	54.5316	7.56809
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13	2006	1	0	0	1	1	70	100	92.0958	3.28434
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15	2003	1	0	0	1	1	70	100	32.2251	6.42943
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16	2005	1	0	0	1	1	70	100	13.1425	18.5097
16	2006	1	0	0	1	1	70	100	8.02483	22.3305

index N Npos mean\_effN mean(inputN) HarMean(effN) Mean(effN/inputN)  
 MeaneffN/MeaninputN

1	0	25	275.291	200	47.1266	1.37645	1.37645
2	0	25	60.2614	200	11.747	0.301307	0.301307
3	0	18	68.6148	200	19.3913	0.343074	0.343074
4	0	13	121.069	200	14.8229	0.605343	0.605343
5	0	25	125.944	200	52.6828	0.629718	0.629718
6	0	25	488.171	200	25.8763	2.44085	2.44085
7	0	15	185.051	100	23.6539	1.85051	1.85051
8	0	25	55.1439	100	15.0581	0.551439	0.551439
9	0	25	35.8521	100	17.5617	0.358521	0.358521
10	0	25	2926.93	100	7.65303	29.2693	29.2693
11	0	25	41.0652	100	4.58774	0.410652	0.410652









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 0.981231  
 17 1982 1 1982-17 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 17 2006 1 2006-17 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 18 1982 1 1982-18 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 18 2006 1 2006-18 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 19 1982 1 1982-19 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 19 2006 1 2006-19 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

AGE\_SELEX\_from\_size\_selex\_in\_endyear

fleet	year	morph	season	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	2006	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	2006	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3	2006	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4	2006	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
5	2006	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
6	2006	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
7	2006	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
8	2006	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
9	2006	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
10	2006	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
11	2006	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
12	2006	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

13 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
 14 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
 15 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
 16 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
 17 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
 18 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
 19 2006 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

AGE\_SELEX\_mortality\_in\_endyear

fleet	year	morph	season	label	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	2006	1	1	sel*wt	0.000307115	0.0376789	0.549828	1.22382	1.66059	2.08799	2.48742	2.84605	3.15612	3.41532	3.62629	3.79461	3.92695	4.02974	4.10865	4.16834
1	2006	1	1	sel*ret*wt	0.000307115	0.0376789	0.549828	1.22382	1.66059	2.08799	2.48742	2.84605	3.15612	3.41532	3.62629	3.79461	3.92695	4.02974	4.10865	4.16834
1	2006	1	1	sel_nums	0.00171496	0.0845306	0.680925	0.99941	0.999992	0.999917	0.999592	0.999021	0.998203	0.99714	0.995832	0.994281	0.992487	0.990451	0.988176	0.985663
1	2006	1	1	sel*ret_nums	0.00171496	0.0845306	0.680925	0.99941	0.999992	0.999917	0.999592	0.999021	0.998203	0.99714	0.995832	0.994281	0.992487	0.990451	0.988176	0.985663
1	2006	1	1	dead_nums	0.00171496	0.0845306	0.680925	0.99941	0.999992	0.999917	0.999592	0.999021	0.998203	0.99714	0.995832	0.994281	0.992487	0.990451	0.988176	0.985663
1	2006	1	1	dead*wt	0.000307115	0.0376789	0.549828	1.22382	1.66059	2.08799	2.48742	2.84605	3.15612	3.41532	3.62629	3.79461	3.92695	4.02974	4.10865	4.16834
2	2006	1	1	sel*wt	0.000131324	0.0123618	0.240667	1.1148	1.66043	2.08815	2.48805	2.84727	3.15801	3.41796	3.62972	3.79885	3.93202	4.03565	4.11538	4.17589
2	2006	1	1	sel*ret*wt	0.000131324	0.0123618	0.240667	1.1148	1.66043	2.08815	2.48805	2.84727	3.15801	3.41796	3.62972	3.79885	3.93202	4.03565	4.11538	4.17589
2	2006	1	1	sel_nums	0.000733328	0.0277331	0.29805	0.910385	0.999895	0.999995	0.999846	0.999447	0.998802	0.997911	0.996774	0.995393	0.993769	0.991903	0.989795	0.987449
2	2006	1	1	sel*ret_nums	0.000733328	0.0277331	0.29805	0.910385	0.999895	0.999995	0.999846	0.999447	0.998802	0.997911	0.996774	0.995393	0.993769	0.991903	0.989795	0.987449
2	2006	1	1	dead_nums	0.000733328	0.0277331	0.29805	0.910385	0.999895	0.999995	0.999846	0.999447	0.998802	0.997911	0.996774	0.995393	0.993769	0.991903	0.989795	0.987449
2	2006	1	1	dead*wt	0.000131324	0.0123618	0.240667	1.1148	1.66043	2.08815	2.48805	2.84727	3.15801	3.41796	3.62972	3.79885	3.93202	4.03565	4.11538	4.17589
3	2006	1	1	sel*wt	0.00951124	0.220262	0.80717	1.22451	1.6606	2.08816	2.48842	2.84884	3.16179	3.42511	3.64145	3.81642	3.95664	4.06842	4.15009	0.00122562
3	2006	1	1	sel*ret*wt	0.00951124	0.220262	0.80717	1.22451	1.6606	2.08816	2.48842	2.84884	3.16179	3.42511	3.64145	3.81642	3.95664	4.06842	4.15009	0.00122562
3	2006	1	1	sel_nums	0.0531117	0.494146	0.999627	0.999976	0.999996	0.999997	0.999998	0.999998	0.999997	0.999997	0.999997	0.999995	0.999991	0.999958	0.998144	0.000289815
3	2006	1	1	sel*ret_nums	0.0531117	0.494146	0.999627	0.999976	0.999996	0.999997	0.999997	0.999998	0.999998	0.999997	0.999997	0.999997	0.999995	0.999991	0.999958	0.998144

3 2006 1 1 dead\_nums 0.0531117 0.494146 0.999627 0.999976 0.999996 0.999997  
0.999998 0.999998 0.999997 0.999997 0.999997 0.999995 0.999991 0.999958  
0.998144 0.000289815  
3 2006 1 1 dead\*wt 0.00951124 0.220262 0.80717 1.22451 1.6606 2.08816  
2.48842 2.84884 3.16179 3.42511 3.64145 3.81642 3.95664 4.06842 4.15009  
0.00122562  
4 2006 1 1 sel\*wt 0.0014806 0.108204 0.780011 1.22404 1.4622 1.58809 1.86922  
2.13968 2.37474 2.57251 2.735 2.86641 2.97174 3.0558 3.12281 3.17626  
4 2006 1 1 sel\*ret\*wt 0.0014806 0.108204 0.780011 1.22404 1.4622 1.58809  
1.86922 2.13968 2.37474 2.57251 2.735 2.86641 2.97174 3.0558 3.12281 3.17626  
4 2006 1 1 sel\_nums 0.00826784 0.24275 0.965991 0.999591 0.88052 0.760519  
0.751165 0.751071 0.751071 0.751071 0.751071 0.751071 0.751071 0.751071  
0.751071 0.751071  
4 2006 1 1 sel\*ret\_nums 0.00826784 0.24275 0.965991 0.999591 0.88052  
0.760519 0.751165 0.751071 0.751071 0.751071 0.751071 0.751071 0.751071  
0.751071 0.751071 0.751071  
4 2006 1 1 dead\_nums 0.00826784 0.24275 0.965991 0.999591 0.88052 0.760519  
0.751165 0.751071 0.751071 0.751071 0.751071 0.751071 0.751071 0.751071  
0.751071 0.751071  
4 2006 1 1 dead\*wt 0.0014806 0.108204 0.780011 1.22404 1.4622 1.58809  
1.86922 2.13968 2.37474 2.57251 2.735 2.86641 2.97174 3.0558 3.12281 3.17626  
5 2006 1 1 sel\*wt 0.000750575 0.0436764 0.488882 1.22329 1.66058 2.08806  
2.48763 2.84645 3.15672 3.41615 3.62734 3.79591 3.92849 4.03154 4.11068  
4.17061  
5 2006 1 1 sel\*ret\*wt 0.000750575 0.0436764 0.488882 1.22329 1.66058 2.08806  
2.48763 2.84645 3.15672 3.41615 3.62734 3.79591 3.92849 4.03154 4.11068  
4.17061  
5 2006 1 1 sel\_nums 0.00419129 0.0979857 0.605447 0.99898 0.999986 0.999953  
0.99968 0.999159 0.998392 0.99738 0.996123 0.994621 0.992877 0.990892  
0.988666 0.986202  
5 2006 1 1 sel\*ret\_nums 0.00419129 0.0979857 0.605447 0.99898 0.999986  
0.999953 0.99968 0.999159 0.998392 0.99738 0.996123 0.994621 0.992877  
0.990892 0.988666 0.986202  
5 2006 1 1 dead\_nums 0.00419129 0.0979857 0.605447 0.99898 0.999986 0.999953  
0.99968 0.999159 0.998392 0.99738 0.996123 0.994621 0.992877 0.990892  
0.988666 0.986202  
5 2006 1 1 dead\*wt 0.000750575 0.0436764 0.488882 1.22329 1.66058 2.08806  
2.48763 2.84645 3.15672 3.41615 3.62734 3.79591 3.92849 4.03154 4.11068  
4.17061  
6 2006 1 1 sel\*wt 0.0136034 0.309009 0.806938 1.05051 0.243565 0.0141681  
0.00882758 0.0100774 0.0111843 0.0121157 0.012881 0.0134999 0.0139959  
0.0143918 0.0147074 0.0149591  
6 2006 1 1 sel\*ret\*wt 0.0136034 0.309009 0.806938 1.05051 0.243565 0.0141681  
0.00882758 0.0100774 0.0111843 0.0121157 0.012881 0.0134999 0.0139959  
0.0143918 0.0147074 0.0149591  
6 2006 1 1 sel\_nums 0.075963 0.693246 0.999339 0.857884 0.146672 0.00678497  
0.00354745 0.00353737 0.00353733 0.00353732 0.00353731 0.0035373 0.0035373  
0.0035373 0.00353729 0.00353729  
6 2006 1 1 sel\*ret\_nums 0.075963 0.693246 0.999339 0.857884 0.146672  
0.00678497 0.00354745 0.00353737 0.00353733 0.00353732 0.00353731 0.0035373  
0.0035373 0.0035373 0.00353729 0.00353729  
6 2006 1 1 dead\_nums 0.075963 0.693246 0.999339 0.857884 0.146672 0.00678497  
0.00354745 0.00353737 0.00353733 0.00353732 0.00353731 0.0035373 0.0035373  
0.0035373 0.00353729 0.00353729  
6 2006 1 1 dead\*wt 0.0136034 0.309009 0.806938 1.05051 0.243565 0.0141681  
0.00882758 0.0100774 0.0111843 0.0121157 0.012881 0.0134999 0.0139959  
0.0143918 0.0147074 0.0149591

ENVIRONMENTAL\_DATA Begins\_in\_startyr-1

NUMBERS\_AT\_AGE

Population 1 gmorph 1 gender: 1 GrowPattern: 1 birthseason: 1  
Year Per Seas 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15  
1980 VIRG 1 45538.3 37283.6 30525.2 24991.9 20461.7 16752.6 13715.9 11229.6  
9194.02 7527.43 6162.94 5045.79 4131.14 3382.29 2769.19 12482.1  
1981 INIT 1 43197 34167.7 14497.7 2177.33 326.874 49.0723 7.36998 1.10778  
0.166717 0.0251318 0.00379636 0.000574899 8.73119e-005 1.33043e-005 2.03481e-  
006 3.69501e-007  
1982 TIME 1 44297.1 34167.7 14497.7 2177.33 326.874 49.0723 7.36998 1.10778  
0.166717 0.0251318 0.00379636 0.000574899 8.73119e-005 1.33043e-005 2.03481e-  
006 3.69501e-007  
1983 TIME 1 62916.4 34496.2 13739.7 2273.85 270.692 41.1735 6.20238 0.932324  
0.140314 0.0211531 0.00319569 0.000484008 7.35221e-005 1.12057e-005 1.71431e-  
006 3.11418e-007  
1984 TIME 1 36151.1 50120.6 17964.7 3246.65 426.958 51.5916 7.87606 1.18722  
0.178626 0.0269177 0.00406467 0.000615296 9.34102e-005 1.42277e-005 2.17511e-  
006 3.94779e-007  
1985 TIME 1 47725.9 28202.5 20209.6 2459.76 308.956 41.1475 4.9899 0.762467  
0.115091 0.0173491 0.00262072 0.000396904 6.02903e-005 9.18939e-006 1.40598e-  
006 2.55447e-007  
1986 TIME 1 52311.7 37547.1 12570.3 3569.68 336.151 42.2943 5.63938 0.684394  
0.1047 0.0158294 0.00239108 0.000362093 5.49989e-005 8.38252e-006 1.2825e-006  
2.3302e-007  
1987 TIME 1 38847.8 40532.7 13866.3 1618.99 371.946 36.0175 4.5607 0.608732  
0.0739782 0.0113387 0.00171837 0.000260312 3.95534e-005 6.03107e-006  
9.23217e-007 1.6786e-007  
1988 TIME 1 10621.7 30481.4 17509.3 2418.08 234.261 55.0735 5.36132 0.679452  
0.0907935 0.0110514 0.00169722 0.000257833 3.91689e-005 5.97085e-006  
9.13757e-007 1.66092e-007  
1989 TIME 1 23587 8239.23 11073.4 2001.96 215.537 21.2305 5.01224 0.488437  
0.0619927 0.00830073 0.00101296 0.000156049 2.37924e-005 3.62954e-006  
5.55886e-007 1.0115e-007  
1990 TIME 1 28244.9 18257.1 3821.36 2286.03 336.65 36.3249 3.58197 0.846196  
0.0825425 0.0104906 0.00140711 0.000172073 2.65737e-005 4.06313e-006  
6.21814e-007 1.14363e-007  
1991 TIME 1 26297 21550.2 8566.97 964.998 491.33 73.9284 8.01547 0.790881  
0.186984 0.0182594 0.00232386 0.000312223 3.82566e-005 5.92144e-006 9.07702e-  
007 1.68093e-007  
1992 TIME 1 32432.6 20078.5 9174.63 1678.26 156.587 82.4243 12.4926 1.35555  
0.133885 0.0316971 0.00310064 0.000395445 5.3261e-005 6.54448e-006 1.0162e-  
006 1.87993e-007  
1993 TIME 1 28239.9 24940.6 8138.58 1529.41 243.813 23.3696 12.375 1.87723  
0.203926 0.0201724 0.00478505 0.000469176 6.00011e-005 8.10672e-006 9.99645e-  
007 1.86477e-007  
1994 TIME 1 28620.9 21654.3 10567.3 1633.44 265.529 45.2531 4.39811 2.33111  
0.353958 0.0385012 0.00381482 0.000906713 8.91114e-005 1.14267e-005 1.54851e-  
006 2.29819e-007  
1995 TIME 1 34451 22182.3 9515.15 2163.93 285.351 50.1376 8.81728 0.858771  
0.455607 0.0692695 0.00754701 0.000749264 0.0001785 1.75897e-005 2.26228e-006  
3.54915e-007  
1996 TIME 1 25144.7 27895.5 14468.2 1926.21 154.602 19.9589 3.55233 0.62539  
0.0609846 0.0324128 0.00493979 0.000539807 5.37839e-005 1.28666e-005  
1.27392e-006 1.91109e-007

1997 TIME 1 25677 20387 18863.9 3791.7 216.248 17.0245 2.21519 0.394562  
 0.069531 0.00679023 0.00361598 0.000552423 6.05431e-005 6.05267e-006  
 1.45356e-006 1.66951e-007  
 1998 TIME 1 27386.1 20892.1 14834.6 7960.09 1070.81 61.7709 4.8876 0.636245  
 0.113387 0.0199972 0.00195492 0.0010424 0.000159497 1.75116e-005 1.75427e-006  
 4.71578e-007  
 1999 TIME 1 21247.3 22283.1 15339.2 6788.65 2538.52 346.333 20.1053 1.59153  
 0.207274 0.0369643 0.00652508 0.000638611 0.00034098 5.22552e-005 5.74752e-  
 006 7.34422e-007  
 2000 TIME 1 26996.8 17271.7 16466.7 8003.09 2790.3 1060.76 145.762 8.46559  
 0.670341 0.0873426 0.0155856 0.0027533 0.000269707 0.000144157 2.21184e-005  
 2.76496e-006  
 2001 TIME 1 29162.3 21941.2 12639.8 7941.81 2832.17 1011.03 387.231 53.2332  
 3.09293 0.245056 0.0319548 0.00570765 0.00100947 9.90189e-005 5.30068e-005  
 9.19373e-006  
 2002 TIME 1 33483.4 23703.2 16195.4 6617.68 3275.38 1214.12 437.983 167.832  
 23.0796 1.34159 0.106362 0.0138802 0.00248153 0.00043936 4.31499e-005  
 2.71883e-005  
 2003 TIME 1 24764.3 27287.2 18021.6 9164.91 2996.53 1504.56 560.885 202.399  
 77.5804 10.6731 0.620762 0.0492486 0.00643225 0.00115108 0.000204027  
 3.28655e-005  
 2004 TIME 1 40333.2 20179.2 20745.2 10293.6 4251.72 1412.77 713.005 265.876  
 95.9696 36.8005 5.06551 0.294814 0.023408 0.00306009 0.000548195 0.000113196  
 2005 TIME 1 23368.8 32877.8 15426 12139.4 4936.17 2075.59 693.563 350.13  
 130.596 47.1577 18.0923 2.49195 0.145142 0.0115342 0.00150936 0.000326933  
 2006 TIME 1 25925.7 19058.5 25332.3 9405.91 6263.98 2592.44 1095.62 366.197  
 184.909 68.9926 24.9239 9.5674 1.31863 0.0768607 0.00611328 0.000975072  
 2007 FORE 1 41729.8 21161.6 14899.7 16683.5 5453.01 3678.07 1528.03 645.902  
 215.92 109.054 40.7031 14.7101 5.64942 0.779069 0.0454397 0.00419682

CATCH\_AT\_AGE

fleet 1 fleetarea 1 gmorph 1  
 Year Seas 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15  
 1981 E 1328.04 15081.2 11020.7 1655.29 248.502 37.303 5.60131 0.841681  
 0.126619 0.0190778 0.00288014 0.000435845 6.61403e-005 1.00691e-005 1.53846e-  
 006 2.79058e-007  
 1982 1 555.344 6055.43 4597.46 637.327 96.1036 14.4409 2.16842 0.325836  
 0.0490177 0.00738561 0.00111501 0.000168738 2.56073e-005 3.89862e-006  
 5.95704e-007 1.08061e-007  
 1983 1 970.72 8329.43 6169.05 936.801 112.135 17.0751 2.57157 0.386401  
 0.0581238 0.00875704 0.00132199 0.000200054 3.03594e-005 4.62213e-006  
 7.06272e-007 1.2813e-007  
 1984 1 532.188 10433.6 6374.38 1021.17 134.836 16.3079 2.48911 0.375095  
 0.0564149 0.00849755 0.00128248 0.000194021 2.94348e-005 4.47992e-006  
 6.84306e-007 1.24086e-007  
 1985 1 715.596 6217.37 7959 885 111.225 14.8156 1.79626 0.274383 0.0413992  
 0.00623741 0.000941635 0.000142508 2.16297e-005 3.2938e-006 5.03448e-007  
 9.13692e-008  
 1986 1 847.131 8312.39 4820.55 1275.96 121.256 15.2847 2.03771 0.247228  
 0.0378078 0.00571358 0.000862597 0.000130548 1.98153e-005 3.01775e-006  
 4.61309e-007 8.37363e-008  
 1987 1 615.558 9328.1 5751.65 628.676 145.597 14.1217 1.78782 0.238548  
 0.028978 0.00443912 0.000672324 0.000101775 1.54514e-005 2.35383e-006  
 3.59945e-007 6.53709e-008  
 1988 1 207.98 8099.26 7796.26 993.506 96.7564 22.7719 2.21646 0.280824  
 0.0375132 0.00456422 0.000700612 0.000106373 1.61495e-005 2.46004e-006  
 3.76176e-007 6.83173e-008

1989 1 363.866 1916.28 4788.99 803.344 86.5586 8.52743 2.0127 0.196062  
0.0248721 0.00332832 0.000405871 6.24736e-005 9.5162e-006 1.45016e-006  
2.2185e-007 4.13929e-008  
1990 1 251.987 2485.28 1039.19 584.607 86.7932 9.37995 0.924716 0.218359  
0.0212878 0.00270365 0.000362338 4.42667e-005 6.82867e-006 1.04281e-006  
1.59382e-007 3.05562e-008  
1991 1 297.308 3562.75 2680.37 282.035 145.316 21.9171 2.37583 0.234334  
0.0553756 0.00540427 0.000687304 9.2266e-005 1.12946e-005 1.74634e-006  
2.67397e-007 5.10036e-008  
1992 1 535.657 4732.24 3940.64 686.81 64.6874 34.1134 5.16945 0.560741  
0.0553589 0.013099 0.00128053 0.00016319 2.19606e-005 2.69581e-006 4.18159e-  
007 7.88199e-008  
1993 1 302.994 3896.99 2433.33 433.723 70.8413 6.82315 3.61257 0.547802  
0.0594788 0.00588 0.00139375 0.00013654 1.74445e-005 2.35432e-006 2.89971e-  
007 5.5294e-008  
1994 1 305.083 3397.2 3146.35 458.887 76.7394 13.2273 1.28594 0.681326  
0.103402 0.0112404 0.00111291 0.000264291 2.59489e-005 3.32374e-006 4.49886e-  
007 6.74678e-008  
1995 1 55.3359 1585.26 3360.96 790.609 103.651 18.2814 3.21499 0.313064  
0.166046 0.0252365 0.00274843 0.000272732 6.49386e-005 6.3952e-006 8.21955e-  
007 1.29438e-007  
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0.018403 0.0097774 0.00148941 0.00016267 1.61974e-005 3.87206e-006 3.83068e-  
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1997 1 56.7504 998.607 4465.08 1254.51 71.9446 5.67516 0.73837 0.131475  
0.0231586 0.00226025 0.00120275 0.000183584 2.00991e-005 2.00699e-006  
4.81346e-007 5.55131e-008  
1998 1 48.184 818.114 2894.95 2201.52 298.158 17.2434 1.36425 0.177534  
0.0316233 0.00557359 0.000544437 0.000290026 4.43274e-005 4.86065e-006  
4.86239e-007 1.31202e-007  
1999 1 20.493 480.03 1739.4 1144.58 431.465 59.0445 3.42737 0.271204  
0.0353004 0.00629054 0.00110939 0.000108454 5.78322e-005 8.84957e-006  
9.71767e-007 1.26805e-007  
2000 1 46.4797 661.17 3219.36 2261.78 797.156 303.981 41.767 2.42489  
0.191913 0.0249883 0.00445517 0.000786228 7.69257e-005 4.10607e-005 6.29053e-  
006 7.93335e-007  
2001 1 34.4835 579.2 1760.04 1644.08 596.709 213.97 81.9467 11.2611 0.653915  
0.0517718 0.00674468 0.00120338 0.000212557 2.08191e-005 1.11265e-005  
1.93435e-006  
2002 1 24.215 387.619 1426.5 871.172 434.321 161.388 58.2114 22.2974 3.06446  
0.177997 0.0140982 0.0018377 0.00032811 5.80042e-005 5.68696e-006 3.59424e-  
006  
2003 1 21.8931 545.504 1948.75 1490.61 491.313 247.237 92.1534 33.2409  
12.7339 1.75049 0.101712 0.00806008 0.00105129 0.000187844 3.32376e-005  
5.37678e-006  
2004 1 27.7723 314.972 1766.22 1322.79 551.237 183.613 92.6535 34.536  
12.4585 4.77358 0.656429 0.0381595 0.00302569 0.000394927 7.0625e-005  
1.45857e-005  
2005 1 14.1551 453.035 1177 1417.18 581.398 245.016 81.8594 41.3077 15.3979  
5.55558 2.12926 0.292917 0.0170366 0.00135169 0.000176561 3.82336e-005  
2006 1 13.7498 231.45 1752.97 1012.76 679.065 281.521 118.955 39.7412  
20.0539 7.47597 2.69782 1.03426 0.142334 0.00828225 0.000657485 0.00010487  
fleet 6 fleetarea 1 gmorph 1  
Year Seas 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15  
1981 E 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
1982 1 63.1746 333.136 142.163 16.9699 0.433075 0.00151139 3.75664e-006  
4.59391e-007 6.91138e-008 1.04226e-008 1.57552e-009 2.38812e-010 3.63103e-011  
5.54009e-012 8.48575e-013 1.54345e-013  
1983 1 101.496 421.18 175.332 22.9266 0.464451 0.00164255 4.09477e-006  
5.00722e-007 7.53253e-008 1.13585e-008 1.71692e-009 2.60235e-010 3.95671e-011  
6.03703e-012 9.24711e-013 1.68209e-013  
1984 1 54.5825 517.512 177.711 24.5144 0.547822 0.00153881 3.88784e-006  
4.76796e-007 7.17156e-008 1.08116e-008 1.63382e-009 2.47571e-010 3.76302e-011  
5.73964e-012 8.78856e-013 1.59791e-013

1985 1 18.9381 79.574 57.2551 5.4821 0.116604 0.000360733 7.23957e-007  
8.99968e-008 1.35797e-008 2.04776e-009 3.09539e-010 4.69213e-011 7.13518e-012  
1.08891e-012 1.6684e-013 3.03606e-014  
1986 1 145.169 688.886 224.548 51.1796 0.823138 0.0024098 5.31792e-006  
5.2508e-007 8.03039e-008 1.21462e-008 1.83611e-009 2.78328e-010 4.23266e-011  
6.46003e-012 9.8991e-013 1.8017e-013  
1987 1 89.9487 659.198 228.458 21.5025 0.842795 0.0018985 3.97855e-006  
4.32021e-007 5.24838e-008 8.04694e-009 1.22031e-009 1.85025e-010 2.81437e-011  
4.29663e-012 6.58629e-013 1.19937e-013  
1988 1 18.7317 352.776 190.867 20.9442 0.345207 0.00188693 3.04013e-006  
3.13468e-007 4.18766e-008 5.09953e-009 7.83789e-010 1.19194e-010 1.81301e-011  
2.76773e-012 4.24254e-013 7.72556e-014  
1989 1 9.27302 23.6177 33.1751 4.79202 0.0873845 0.000199939 7.81151e-007  
6.19264e-008 7.8564e-009 1.05224e-009 1.2848e-010 1.9808e-011 3.02295e-012  
4.61659e-013 7.07977e-014 1.32449e-014  
1990 1 59.8975 285.695 67.1449 32.526 0.817259 0.0020513 3.34745e-006  
6.43285e-007 6.27181e-008 7.97238e-009 1.06982e-009 1.3091e-010 2.02326e-011  
3.09642e-012 4.74405e-013 9.11953e-014  
1991 1 84.8511 491.736 207.938 18.8404 1.64289 0.00575484 1.03262e-005  
8.28873e-007 1.95884e-007 1.91335e-008 2.43649e-009 3.27609e-010 4.01797e-011  
6.22594e-012 9.55621e-013 1.82765e-013  
1992 1 84.5229 361.12 169.022 25.3665 0.404344 0.00495236 1.24225e-005  
1.09661e-006 1.0827e-007 2.56409e-008 2.50982e-009 3.20366e-010 4.31934e-011  
5.31377e-012 8.26244e-013 1.56159e-013  
1993 1 177.211 1102.26 386.853 59.3753 1.6413 0.00367148 3.21772e-005  
3.97085e-006 4.31172e-007 4.26621e-008 1.01253e-008 9.93533e-010 1.27175e-010  
1.72008e-011 2.12369e-012 4.06049e-013  
1994 1 127.602 687.163 357.714 44.9245 1.27146 0.00508994 8.19103e-006  
3.53182e-006 5.36043e-007 5.83215e-008 5.78183e-009 1.37527e-009 1.35284e-010  
1.73658e-011 2.35625e-012 3.54308e-013  
1995 1 166.608 883.724 335.288 46.1305 1.03339 0.00843209 0.000775558  
7.53496e-005 3.99968e-005 6.08539e-006 6.63609e-007 6.5954e-008 1.57323e-008  
1.55251e-009 1.99998e-010 3.15753e-011  
1996 1 80.4645 747.381 372.068 31.3253 0.427124 0.00255743 0.000238044  
4.18022e-005 4.07825e-006 2.16894e-006 3.30816e-007 3.61855e-008 3.60938e-009  
8.64568e-010 8.57252e-011 1.3e-011  
1997 1 54.2187 372.43 388.5 56.7898 0.55626 0.00202989 0.000138119 2.45367e-  
005 4.32526e-006 4.22568e-007 2.25145e-007 3.44172e-008 3.77467e-009  
3.77673e-010 9.07831e-011 1.04961e-011  
1998 1 71.6539 474.921 392.067 155.123 3.58825 0.00960009 0.000397221  
5.15715e-005 9.19315e-006 1.62193e-006 1.58632e-007 8.46321e-008 1.29578e-008  
1.42371e-009 1.42743e-010 3.86125e-011  
1999 1 50.7743 464.278 392.484 134.37 8.65134 0.0547688 0.00166265  
0.000131258 1.70978e-005 3.0499e-006 5.38552e-007 5.27284e-008 2.81664e-008  
4.31869e-009 4.75301e-010 6.21764e-011  
2000 1 88.2502 490.046 556.679 203.479 12.2489 0.216079 0.015527 0.000899368  
7.12325e-005 9.28429e-006 1.65738e-006 2.92929e-007 2.87109e-008 1.53557e-008  
2.3578e-009 2.98099e-010  
2001 1 129.467 848.88 601.8 292.475 18.1305 0.300756 0.0602393 0.00825882  
0.000479942 3.80364e-005 4.96151e-006 8.86561e-007 1.56871e-007 1.53957e-008  
8.24658e-009 1.43726e-009  
2002 1 80.9093 505.581 434.078 137.923 11.7442 0.201883 0.0380823 0.0145533  
0.00200166 0.000116382 9.22962e-006 1.20489e-006 2.15504e-007 3.81738e-008  
3.75113e-009 2.37669e-009  
2003 1 57.8051 562.246 468.594 186.483 10.4982 0.244392 0.0476399 0.0171445  
0.00657263 0.000904433 5.26184e-005 4.17598e-006 5.45636e-007 9.76893e-008  
1.73243e-008 2.80952e-009

2004 1 105.309 466.225 609.93 237.664 16.9158 0.260659 0.0687886 0.025581  
0.00923511 0.00354207 0.000487694 2.83934e-005 2.25528e-006 2.94959e-007  
5.28664e-008 1.09454e-008  
2005 1 54.8353 685.092 415.244 260.129 18.2272 0.355349 0.0620892 0.0312586  
0.0116608 0.00421148 0.00161615 0.000222665 1.29733e-005 1.03137e-006  
1.35023e-007 2.93118e-008  
2006 1 45.5824 299.521 529.244 159.083 18.2184 0.349401 0.0772115 0.0257355  
0.0129963 0.00484983 0.00175234 0.000672809 9.27536e-005 5.40803e-006  
4.30282e-007 6.88024e-008

BIOLOGY 1 70 15 1 N\_Used\_morphs;\_lengths;\_ages;\_season;\_by\_season\_in\_endyr  
bin low Mean\_Size Wt\_len-F mat\_len spawn Wt\_len-M

1 10 10.5 0.0063863 1 0.0063863  
2 11 11.5 0.00865928 1 0.00865928  
3 12 12.5 0.0114467 1 0.0114467  
4 13 13.5 0.0148098 1 0.0148098  
5 14 14.5 0.0188113 1 0.0188113  
6 15 15.5 0.0235157 1 0.0235157  
7 16 16.5 0.0289892 1 0.0289892  
8 17 17.5 0.0352991 1 0.0352991  
9 18 18.5 0.0425145 1 0.0425145  
10 19 19.5 0.0507059 1 0.0507059  
11 20 20.5 0.0599448 1 0.0599448  
12 21 21.5 0.0703042 1 0.0703042  
13 22 22.5 0.0818585 1 0.0818585  
14 23 23.5 0.0946829 1 0.0946829  
15 24 24.5 0.108854 1 0.108854  
16 25 25.5 0.12445 1 0.12445  
17 26 26.5 0.14155 1 0.14155  
18 27 27.5 0.160232 1 0.160232  
19 28 28.5 0.180579 1 0.180579  
20 29 29.5 0.202673 1 0.202673  
21 30 30.5 0.226596 1 0.226596  
22 31 31.5 0.252433 1 0.252433  
23 32 32.5 0.280267 1 0.280267  
24 33 33.5 0.310187 1 0.310187  
25 34 34.5 0.342277 1 0.342277  
26 35 35.5 0.376627 1 0.376627  
27 36 36.5 0.413324 1 0.413324  
28 37 37.5 0.452458 1 0.452458  
29 38 38.5 0.494119 1 0.494119  
30 39 39.5 0.538399 1 0.538399  
31 40 40.5 0.58539 1 0.58539  
32 41 41.5 0.635184 1 0.635184  
33 42 42.5 0.687876 1 0.687876  
34 43 43.5 0.743558 1 0.743558  
35 44 44.5 0.802328 1 0.802328  
36 45 45.5 0.86428 1 0.86428  
37 46 46.5 0.929512 1 0.929512  
38 47 47.5 0.99812 1 0.99812  
39 48 48.5 1.0702 1 1.0702  
40 49 49.5 1.14586 1 1.14586  
41 50 50.5 1.22519 1 1.22519  
42 51 51.5 1.3083 1 1.3083  
43 52 52.5 1.39527 1 1.39527  
44 53 53.5 1.48623 1 1.48623  
45 54 54.5 1.58127 1 1.58127

46 55 55.5 1.68048 1 1.68048  
47 56 56.5 1.78398 1 1.78398  
48 57 57.5 1.89188 1 1.89188  
49 58 58.5 2.00426 1 2.00426  
50 59 59.5 2.12125 1 2.12125  
51 60 60.5 2.24294 1 2.24294  
52 61 61.5 2.36945 1 2.36945  
53 62 62.5 2.50088 1 2.50088  
54 63 63.5 2.63734 1 2.63734  
55 64 64.5 2.77893 1 2.77893  
56 65 65.5 2.92577 1 2.92577  
57 66 66.5 3.07797 1 3.07797  
58 67 67.5 3.23564 1 3.23564  
59 68 68.5 3.39888 1 3.39888  
60 69 69.5 3.56782 1 3.56782  
61 70 70.5 3.74255 1 3.74255  
62 71 71.5 3.9232 1 3.9232  
63 72 72.5 4.10988 1 4.10988  
64 73 73.5 4.30271 1 4.30271  
65 74 74.5 4.50178 1 4.50178  
66 75 75.5 4.70723 1 4.70723  
67 76 76.5 4.91917 1 4.91917  
68 77 77.5 5.13771 1 5.13771  
69 78 78.5 5.36296 1 5.36296  
70 79 79.5 5.59506 1 5.59506

Growth\_Parameters

Count Yr Morph A1 A2 L-at-A1 L-at-A2 K A-at-L0 Linf CVmin CVmax natM\_amin  
natM\_max M\_young M\_old  
1 1982 1 0.5 6 28.1 60.2 0.2052 -1.76669 75.5491 0.1 0.1 0 2 0.2 0.2

Season gmorph GrowPattern Sex BirthSeas age age\_Beg age\_Mid M Len\_Beg Len\_Mid  
SD\_Beg SD\_Mid Wt\_Beg Wt\_Mid Len\_Mat Age\_Mat Mat\*Fecund Len:\_1 SelWt:\_1  
RetWt:\_1 Len:\_2 SelWt:\_2 RetWt:\_2 Len:\_3 SelWt:\_3 RetWt:\_3 Len:\_4 SelWt:\_4  
RetWt:\_4 Len:\_5 SelWt:\_5 RetWt:\_5 Len:\_6 SelWt:\_6 RetWt:\_6 Len:\_7 SelWt:\_7  
RetWt:\_7 Len:\_8 SelWt:\_8 RetWt:\_8 Len:\_9 SelWt:\_9 RetWt:\_9 Len:\_10 SelWt:\_10  
RetWt:\_10 Len:\_11 SelWt:\_11 RetWt:\_11 Len:\_12 SelWt:\_12 RetWt:\_12 Len:\_13  
SelWt:\_13 RetWt:\_13 Len:\_14 SelWt:\_14 RetWt:\_14 Len:\_15 SelWt:\_15 RetWt:\_15  
Len:\_16 SelWt:\_16 RetWt:\_16 Len:\_17 SelWt:\_17 RetWt:\_17 Len:\_18 SelWt:\_18  
RetWt:\_18 Len:\_19 SelWt:\_19 RetWt:\_19  
1 1 1 1 1 0 0 0.5 0.2 10 28.11 2.81 0.006815 0.17908 1 0.38 0.0025897 28.1  
0.17908 0.17908 28.1 0.17908 0.17908 28.1 0.17908 0.17908 28.1 0.17908  
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1 1 1 1 1 1 1 1.5 0.2 32.7269 36.9026 3.27269 3.69026 0.298237 0.445742 1  
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1 1 1 1 1 2 2 2.5 0.2 40.6711 44.0721 4.06711 4.40721 0.61717 0.807472 1 0.98  
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1 1 1 1 1 3 3 3.5 0.2 47.1415 49.9116 4.71415 4.99116 1.01154 1.22454 1 1  
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1 1 1 1 1 4 4 4.5 0.2 52.4115 54.6677 5.24115 5.46677 1.44214 1.66061 1 1  
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1 1 1 1 1 5 5 5.5 0.2 56.7039 58.5416 5.67039 5.85416 1.8768 2.08816 1 1  
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1 1 1 1 1 6 6 6.5 0.2 60.2 61.6967 6.02 6.16967 2.29261 2.48843 1 1 2.29261  
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1 1 1 1 1 7 7 7.5 0.2 63.0475 64.2666 6.30475 6.42666 2.67421 2.84884 1 1  
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1 1 1 1 1 8 8 8.5 0.2 65.3667 66.3596 6.53667 6.63596 3.01152 3.1618 1 1  
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1 1 1 1 1 9 9 9.5 0.2 67.2557 68.0644 6.72557 6.80644 3.29959 3.42512 1 1  
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 1 1 1 1 1 10 10 10.5 0.2 68.7943 69.453 6.87943 6.9453 3.53886 3.64146 1 1  
 3.53886 69.2242 3.64146 3.64146 69.2242 3.64146 3.64146 69.2242 3.64146  
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 1 1 1 1 1 12 12 12.5 0.2 71.0681 71.505 7.10681 7.1505 3.89048 3.95667 1 1  
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 1 1 1 1 1 13 13 13.5 0.2 71.8994 72.2553 7.18994 7.22553 4.0158 4.06859 1 1  
 4.0158 71.6577 4.06859 4.06859 71.6577 4.06859 4.06859 71.6577 4.06859  
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 1 1 1 1 1 14 14 14.5 0.2 72.5765 72.8663 7.25765 7.28663 4.11573 4.15781 1 1  
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 1 1 1 1 1 15 15 15.5 0.2 73.1279 73.364 7.31279 7.3364 4.19539 4.22897 1 1  
 4.19539 72.5389 4.22897 4.22897 72.5389 4.22897 4.22897 72.5389 4.22897  
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MEAN\_BODY\_WT(begin)  
 morph year season 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

1 1982 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539  
1 1983 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539  
1 1984 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539  
1 1985 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539  
1 1986 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539  
1 1987 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539  
1 1988 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539  
1 1989 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539  
1 1990 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539  
1 1991 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539  
1 1992 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539  
1 1993 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539  
1 1994 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539  
1 1995 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539  
1 1996 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539  
1 1997 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539  
1 1998 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539  
1 1999 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539  
1 2000 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539  
1 2001 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539  
1 2002 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539  
1 2003 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539  
1 2004 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539  
1 2005 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539  
1 2006 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539  
1 2007 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539

MEAN\_SIZE\_TIMESERIES

morph year season beg/mid 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15  
1 1982 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279



1 1996 1 1 28.1 36.9026 44.0721 49.9116 54.6677 58.5416 61.6967 64.2666  
66.3596 68.0644 69.453 70.5839 71.505 72.2553 72.8663 73.364  
1 1997 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
1 1997 1 1 28.1 36.9026 44.0721 49.9116 54.6677 58.5416 61.6967 64.2666  
66.3596 68.0644 69.453 70.5839 71.505 72.2553 72.8663 73.364  
1 1998 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
1 1998 1 1 28.1 36.9026 44.0721 49.9116 54.6677 58.5416 61.6967 64.2666  
66.3596 68.0644 69.453 70.5839 71.505 72.2553 72.8663 73.364  
1 1999 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
1 1999 1 1 28.1 36.9026 44.0721 49.9116 54.6677 58.5416 61.6967 64.2666  
66.3596 68.0644 69.453 70.5839 71.505 72.2553 72.8663 73.364  
1 2000 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
1 2000 1 1 28.1 36.9026 44.0721 49.9116 54.6677 58.5416 61.6967 64.2666  
66.3596 68.0644 69.453 70.5839 71.505 72.2553 72.8663 73.364  
1 2001 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
1 2001 1 1 28.1 36.9026 44.0721 49.9116 54.6677 58.5416 61.6967 64.2666  
66.3596 68.0644 69.453 70.5839 71.505 72.2553 72.8663 73.364  
1 2002 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
1 2002 1 1 28.1 36.9026 44.0721 49.9116 54.6677 58.5416 61.6967 64.2666  
66.3596 68.0644 69.453 70.5839 71.505 72.2553 72.8663 73.364  
1 2003 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
1 2003 1 1 28.1 36.9026 44.0721 49.9116 54.6677 58.5416 61.6967 64.2666  
66.3596 68.0644 69.453 70.5839 71.505 72.2553 72.8663 73.364  
1 2004 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
1 2004 1 1 28.1 36.9026 44.0721 49.9116 54.6677 58.5416 61.6967 64.2666  
66.3596 68.0644 69.453 70.5839 71.505 72.2553 72.8663 73.364  
1 2005 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
1 2005 1 1 28.1 36.9026 44.0721 49.9116 54.6677 58.5416 61.6967 64.2666  
66.3596 68.0644 69.453 70.5839 71.505 72.2553 72.8663 73.364  
1 2006 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
1 2006 1 1 28.1 36.9026 44.0721 49.9116 54.6677 58.5416 61.6967 64.2666  
66.3596 68.0644 69.453 70.5839 71.505 72.2553 72.8663 73.364  
1 2007 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
1 2007 1 1 28.1 36.9026 44.0721 49.9116 54.6677 58.5416 61.6967 64.2666  
66.3596 68.0644 69.453 70.5839 71.505 72.2553 72.8663 73.364

mean\_size\_Jan\_1\_for\_gender: 1

1 1982 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
1 1983 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
1 1984 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
1 1985 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279

1 1986 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
 67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
 1 1987 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
 67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
 1 1988 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
 67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
 1 1989 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
 67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
 1 1990 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
 67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
 1 1991 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
 67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
 1 1992 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
 67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
 1 1993 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
 67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
 1 1994 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
 67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
 1 1995 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
 67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
 1 1996 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
 67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
 1 1997 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
 67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
 1 1998 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
 67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
 1 1999 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
 67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
 1 2000 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
 67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
 1 2001 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
 67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
 1 2002 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
 67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
 1 2003 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
 67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
 1 2004 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
 67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
 1 2005 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
 67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
 1 2006 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
 67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
 1 2007 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
 67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279

AGE\_LENGTH\_KEY  
 sdratio 1000  
 sdwithin 1  
 sdbetween 1e-006

SEASON: 1 MORPH: 1  
 Age: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15  
 79 0 0 1.11022e-015 2.81379e-009 4.27853e-006 0.000237354 0.00251925  
 0.0109369 0.0284014 0.0540658 0.0846271 0.116561 0.147279 0.175291 0.199958  
 0.221178

78 0 0 5.88418e-015 6.3458e-009 5.58929e-006 0.000206594 0.00159578 0.0053641  
0.0113026 0.0181166 0.0246051 0.0301418 0.0345743 0.0379975 0.0405922  
0.0425435  
77 0 0 3.29736e-014 1.95158e-008 1.21737e-005 0.000363991 0.00244668  
0.00747509 0.0147151 0.0224413 0.0293659 0.034971 0.0392493 0.0424099  
0.0447063 0.0463642  
76 0 0 1.78635e-013 5.76668e-008 2.56452e-005 0.000622912 0.00365424  
0.0101681 0.0187285 0.0272059 0.03433 0.039769 0.0436949 0.046438 0.0483201  
0.0495994  
75 0 0 9.17599e-013 1.63721e-007 5.22525e-005 0.00103544 0.00531659 0.0135012  
0.0233023 0.032279 0.0393113 0.0443281 0.0477034 0.0498855 0.051253 0.0520849  
74 0 0 4.47686e-012 4.466e-007 0.000102973 0.0016718 0.00753503 0.0174988  
0.0283433 0.0374818 0.0440934 0.0484296 0.0510725 0.0525738 0.0533511  
0.0536898  
73 0 0 2.07532e-011 1.1705e-006 0.000196272 0.00262183 0.0104028 0.0221386  
0.0337022 0.0425954 0.0484442 0.0518609 0.0536221 0.0543575 0.0545008  
0.0543272  
72 0 0 9.13976e-011 2.94756e-006 0.000361832 0.00399378 0.0139905 0.02734  
0.0391763 0.0473749 0.0521341 0.0544334 0.0552105 0.0551374 0.0546381  
0.0539614  
71 0 0 3.82414e-010 7.13165e-006 0.000645164 0.00590911 0.0183286 0.0329573  
0.044519 0.0515675 0.0549557 0.0560001 0.0557469 0.0548687 0.053755 0.0526131  
70 0 0 1.52013e-009 1.65788e-005 0.00111262 0.00849217 0.0233906 0.0387803  
0.0494565 0.0549345 0.0567436 0.0564692 0.0551996 0.0535673 0.0519012  
0.0503557  
69 0 0 5.74086e-009 3.70301e-005 0.0018558 0.0118542 0.0290783 0.0445429  
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AGE AGE\_KEY

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Composition\_Database

year	season	fleet	rep	pick_gender	kind	mkt	ageerr	gender	Lbin_lo	Lbin_hi	bin						
obs	exp	Pearson	N	effN	Like	Used											
1982	1	1	1	0	AGE	0	1	1	1	70	0	0.0999438	0.0502525	3.21671	200	81.2288	13.7432
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1982	1	1	1	0	AGE	0	1	1	1	70	1	0.476731	0.529875	-1.50583	200	81.2288	-10.077
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1982	1	1	1	0	AGE	0	1	1	1	70	2	0.390191	0.362313	0.820201	200	81.2288	5.78466
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1982	1	1	1	0	AGE	0	1	1	1	70	3	0.0161747	0.0485435	-2.13001	200	81.2288	-
3.55524	1																
1982	1	1	1	0	AGE	0	1	1	1	70	4	0.00432648	0.0074203	-0.509819	200	81.2288	-
0.466797	1																
1982	1	1	1	0	AGE	0	1	1	1	70	5	0.00682085	0.00120052	2.29537	200	81.2288	
2.36987	1																
1982	1	1	1	0	AGE	0	1	1	1	70	6	0.00404933	0.000265207	3.28659	200	81.2288	
2.20753	1																
1982	1	1	1	0	AGE	0	1	1	1	70	7	0.00176283	0.000129164	2.03299	200	81.2288	
0.921464	1																
1982	1	1	1	0	AGE	0	1	1	1	70							
1982	1	2	1	0	AGE	0	1	1	1	70	0	0.17237	0.0476363	8.28186	200	3.8026	44.3352
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1982	1	2	1	0	AGE	0	1	1	1	70	1	0.608225	0.353956	7.51975	200	3.8026	65.8554
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1.16021	1																
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0.168994	1																
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0.198196	1																
1982	1	2	1	0	AGE	0	1	1	1	70	7	0.00115356	0.000168709	1.07239	200	3.8026	
0.443527	1																
1982	1	2	1	0	AGE	0	1	1	1	70							
1982	1	5	1	0	AGE	0	1	1	1	70	0	0.177705	0.0870522	4.54759	200	43.2307	25.3625
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1982	1	5	1	0	AGE	0	1	1	1	70	1	0.545508	0.592126	-1.34155	200	43.2307	-8.94671
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1982	1	5	1	0	AGE	0	1	1	1	70	2	0.226013	0.276796	-1.60519	200	43.2307	-9.16211
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1982	1	5	1	0	AGE	0	1	1	1	70	3	0.0363313	0.0371383	-0.0603539	200	43.2307	-
0.159637	1																
1982	1	5	1	0	AGE	0	1	1	1	70	4	0.0139854	0.00569662	1.55753	200	43.2307	
2.51217	1																
1982	1	5	1	0	AGE	0	1	1	1	70	5	9.993e-005	0.000941333	-0.388018	200	43.2307	-
0.0448251	1																
1982	1	5	1	0	AGE	0	1	1	1	70	6	0.000358264	0.000248639	0.0983322	200	43.2307	
0.0261726	1																
1982	1	5	1	0	AGE	0	1	1	1	70							
1982	1	6	1	0	AGE	0	1	1	1	70	0	0.212929	0.120506	4.0149	200	12.4067	24.2424
1																	
1982	1	6	1	0	AGE	0	1	1	1	70	1	0.787071	0.879494	-4.0149	200	12.4067	-17.4774
1																	
1982	1	6	1	0	AGE	0	1	1	1	70							
1982	1	8	1	0	AGE	0	1	1	1	70	1	0.307977	0.460681	-3.06357	100	10.0297	-12.4016
1																	
1982	1	8	1	0	AGE	0	1	1	1	70	2	0.629848	0.445303	3.7132	100	10.0297	21.8384
1																	
1982	1	8	1	0	AGE	0	1	1	1	70	3	0.0530788	0.0798293	-0.987001	100	10.0297	-
2.16622	1																

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19 1982 L 1 29 1  
19 1982 L 1 30 1  
19 1982 L 1 31 1  
19 1982 L 1 32 1  
19 1982 L 1 33 1  
19 1982 L 1 34 1  
19 1982 L 1 35 1  
19 1982 L 1 36 1  
19 1982 L 1 37 1  
19 1982 L 1 38 1  
19 1982 L 1 39 1  
19 1982 L 1 40 1  
19 1982 L 1 41 1  
19 1982 L 1 42 1  
19 1982 L 1 43 1  
19 1982 L 1 44 1  
19 1982 L 1 45 1  
19 1982 L 1 46 1  
19 1982 L 1 47 1  
19 1982 L 1 48 1  
19 1982 L 1 49 1  
19 1982 L 1 50 1  
19 1982 L 1 51 1  
19 1982 L 1 52 1  
19 1982 L 1 53 1  
19 1982 L 1 54 1  
19 1982 L 1 55 1  
19 1982 L 1 56 1  
19 1982 L 1 57 1  
19 1982 L 1 58 1  
19 1982 L 1 59 1  
19 1982 L 1 60 1  
19 1982 L 1 61 1  
19 1982 L 1 62 1  
19 1982 L 1 63 1  
19 1982 L 1 64 1  
19 1982 L 1 65 1  
19 1982 L 1 66 1  
19 1982 L 1 67 1  
19 1982 L 1 68 1  
19 1982 L 1 69 1  
19 1982 L 1 70 1  
19 1982 L 1 71 1  
19 1982 L 1 72 1  
19 1982 L 1 73 1  
19 1982 L 1 74 1  
19 1982 L 1 75 1  
19 1982 L 1 76 1  
19 1982 L 1 77 1

19 1982 L 1 78 1  
19 1982 L 1 79 1  
19 1982 A 1 0 1  
19 1982 A 1 1 0  
19 1982 A 1 2 0  
19 1982 A 1 3 0  
19 1982 A 1 4 0  
19 1982 A 1 5 0  
19 1982 A 1 6 0  
19 1982 A 1 7 0  
19 1982 A 1 8 0  
19 1982 A 1 9 0  
19 1982 A 1 10 0  
19 1982 A 1 11 0  
19 1982 A 1 12 0  
19 1982 A 1 13 0  
19 1982 A 1 14 0  
19 1982 A 1 15 0  
19 2006 L 1 10 1  
19 2006 L 1 11 1  
19 2006 L 1 12 1  
19 2006 L 1 13 1  
19 2006 L 1 14 1  
19 2006 L 1 15 1  
19 2006 L 1 16 1  
19 2006 L 1 17 1  
19 2006 L 1 18 1  
19 2006 L 1 19 1  
19 2006 L 1 20 1  
19 2006 L 1 21 1  
19 2006 L 1 22 1  
19 2006 L 1 23 1  
19 2006 L 1 24 1  
19 2006 L 1 25 1  
19 2006 L 1 26 1  
19 2006 L 1 27 1  
19 2006 L 1 28 1  
19 2006 L 1 29 1  
19 2006 L 1 30 1  
19 2006 L 1 31 1  
19 2006 L 1 32 1  
19 2006 L 1 33 1  
19 2006 L 1 34 1  
19 2006 L 1 35 1  
19 2006 L 1 36 1  
19 2006 L 1 37 1  
19 2006 L 1 38 1  
19 2006 L 1 39 1  
19 2006 L 1 40 1  
19 2006 L 1 41 1  
19 2006 L 1 42 1  
19 2006 L 1 43 1  
19 2006 L 1 44 1  
19 2006 L 1 45 1  
19 2006 L 1 46 1  
19 2006 L 1 47 1  
19 2006 L 1 48 1

19 2006 L 1 49 1  
19 2006 L 1 50 1  
19 2006 L 1 51 1  
19 2006 L 1 52 1  
19 2006 L 1 53 1  
19 2006 L 1 54 1  
19 2006 L 1 55 1  
19 2006 L 1 56 1  
19 2006 L 1 57 1  
19 2006 L 1 58 1  
19 2006 L 1 59 1  
19 2006 L 1 60 1  
19 2006 L 1 61 1  
19 2006 L 1 62 1  
19 2006 L 1 63 1  
19 2006 L 1 64 1  
19 2006 L 1 65 1  
19 2006 L 1 66 1  
19 2006 L 1 67 1  
19 2006 L 1 68 1  
19 2006 L 1 69 1  
19 2006 L 1 70 1  
19 2006 L 1 71 1  
19 2006 L 1 72 1  
19 2006 L 1 73 1  
19 2006 L 1 74 1  
19 2006 L 1 75 1  
19 2006 L 1 76 1  
19 2006 L 1 77 1  
19 2006 L 1 78 1  
19 2006 L 1 79 1

**SS2 ALTERNATIVE RUN (F08 MULTI SVAge FLAT6.REP)**

Code\_version: \_\_2.00o;\_01/31/08;\_Stock\_Synthesis\_2\_by\_Richard\_Methot\_(NOAA);\_  
using\_Otter\_Research\_ADMB\_7.0.1

Time: Thu Mar 20 15:25:00 2008

Data\_File: F08\_SVAgecomp6.DAT  
Control\_File: F08\_SVAgecomp\_FLAT6.CTL

Convergence\_Level:  
Hessian:  
Sum\_of\_months\_on\_read\_was:\_ 12 rescaled\_to\_sum\_to: 1

LIKELIHOOD 2882.75  
indices 780.521  
discard 0  
length\_comps 0  
age\_comps 2072.58  
size-at-age 0  
mean\_body\_wt 0  
Equil\_catch 0  
catch 29.6505  
Recruitment 0  
Parm\_priors 0  
Parm\_devs 0  
penalties 0  
Forecast\_Recruitment 0

Fleet surv\_lambda surv\_like disc\_lambda disc\_like length\_lambda length\_like  
age\_lambda age\_like sizeage\_lambda sizeage\_like  
1 0 0 0 0 0 0 1 132.902 0 0  
2 1 56.3759 0 0 0 0 1 94.4645 0 0  
3 1 50.2471 0 0 0 0 1 170.465 0 0  
4 1 28.0924 0 0 0 0 1 184.24 0 0  
5 1 147.366 0 0 0 0 1 118.582 0 0  
6 1 227.645 0 0 0 0 1 384.394 0 0  
7 1 33.8026 0 0 0 0 1 132.792 0 0  
8 1 26.9844 0 0 0 0 1 138.996 0 0  
9 1 56.0583 0 0 0 0 1 336.231 0 0  
10 1 35.6475 0 0 0 0 1 156.394 0 0  
11 1 11.8535 0 0 0 0 1 223.12 0 0  
12 1 28.2231 0 0 0 0 1 0 0 0  
13 1 27.6765 0 0 0 0 1 0 0 0  
14 1 50.548 0 0 0 0 1 0 0 0

Source Lambda Like  
mean\_body\_wt 0 0  
Equil\_catch 0 0  
Catch 10 2.96505  
Recruitment 0 0  
Parm\_priors 0 0  
Parm\_devs 1 0  
penalties 0

```

Variance_adjustments_to_input_values 1 2 3 4 5 6 7 8 9 10 11 12 13 14
Index_extra_CV 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Discard_extra_CV 0 0 0 0 0 0 0 0 0 0 0 0 0 0
MeanBodyWt_extra_CV 0 0 0 0 0 0 0 0 0 0 0 0 0 0
effN_mult_Lencomp 1 1 1 1 1 1 1 1 1 1 1 1 1 1
effN_mult_Agecomp 1 1 1 1 1 1 1 1 1 1 1 1 1 1
effN_mult_Len-at-age 1 1 1 1 1 1 1 1 1 1 1 1 1 1

```

PARAMETERS

```

Num Value Phase Min Max Init Prior PR_type SD Active_Cnt Prior_Like Bound
M-G_parmsUsing_offset_approach#:_3

```

Gender:\_1\_\_Pattern:\_1

```

1 0.2 -3
2 0 -3
3 28.1 -2
4 60.2 -2
5 0.2052 -3
6 0.1 -2
7 0 -3

```

biology\_parms

```

8 2.44e-006 -3
9 3.34694 -3
10 28.1 -3
11 -0.25 -3
12 1 -3
13 0 -3

```

recrdist\_by\_growthpattern:1

```

14 0 -3
recrdist_by_area:1

```

```

15 0 -3
recrdist_by_seas:1

```

```

16 4 -3
cohort_growth_dev:2

```

```

17 1 -3
MGparm_env_linkages

```

```

MG_parm_blockparms
M-G_parm_devs 1

```

```

1_YR1982 0 -

```

MGParm\_Block\_Assignments

```

SR_parms
1 10.7104 1 3 31 10.1121 0 -1 99 1 0
2 0.951334 1 0.2 1 0.8 0 -1 99 2 0
3 0.6 -1
4 0 -1
5 0.261235 1 -5 5 0 0 -1 99 3 0
6 0 -1

```

```

Recr_Devs
1982 0.325619 - - - - - 4
1983 0.804456 - - - - - 5
1984 -0.0671377 - - - - - 6
1985 0.55384 - - - - - 7
1986 0.626122 - - - - - 8
1987 0.364245 - - - - - 9
1988 -1.35316 - - - - - 10
1989 -0.156547 - - - - - 11
1990 0.310527 - - - - - 12

```

```

1991 0.012096 - - - - - 13
1992 0.254122 - - - - - 14
1993 0.0991567 - - - - - 15
1994 0.158374 - - - - - 16
1995 0.246814 - - - - - 17
1996 -0.184163 - - - - - 18
1997 -0.226493 - - - - - 19
1998 -0.145966 - - - - - 20
1999 -0.416833 - - - - - 21
2000 -0.156891 - - - - - 22
2001 -0.0633979 - - - - - 23
2002 -0.0230323 - - - - - 24
2003 -0.351293 - - - - - 25
2004 0.188345 - - - - - 26
2005 -0.452512 - - - - - 27
2006 -0.346291 - - - - - 28
init_F_parms
1 1.6927 1 0 2 1 1 -1 10 29 0
Q_parms
sel_parms
#_size_sel:_1
#_male
#_size_sel:_2
#_male
#_size_sel:_3
#_male
#_size_sel:_4
#_male
#_size_sel:_5
#_male
#_size_sel:_6
#_male
#_size_sel:_7
#_male
#_size_sel:_8
#_male
#_size_sel:_9
#_male
#_size_sel:_10
#_male
#_size_sel:_11
#_male
#_size_sel:_12
#_male
#_size_sel:_13
#_male
#_size_sel:_14
#_male
#_age_sel:_1
1 1.94887 2 0.5 9 4 4 -1 99 30 0
2 -3 -3
3 0.195781 3 0 9 2 2 -1 99 31 0
4 9 -3
5 -999 -2
6 -999 -2
#_male
#_age_sel:_2

```

```

7 3.48574 2 0.5 9 4 4 -1 99 32 0
8 -3 -3
9 1.27732 3 0 9 2 2 -1 99 33 0
10 9 -3
11 -999 -2
12 -999 -2
#_male
#_age_sel:_3
13 3.15264 2 0.5 9 4 4 -1 99 34 0
14 -3 -3
15 1.0745 3 0 9 2 2 -1 99 35 0
16 9 -3
17 -999 -2
18 -999 -2
#_male
#_age_sel:_4
19 1.04469 2 0.5 9 4 4 -1 99 36 0
20 -3 -3
21 6.14273e-008 3 0 9 2 2 -1 99 37 0 LO
22 9 -3
23 -999 -2
24 -999 -2
#_male
#_age_sel:_5
25 2.72982 2 0.5 9 4 4 -1 99 38 0
26 -3 -3
27 3.25786e-009 3 0 9 2 2 -1 99 39 0 LO
28 9 -3
29 -999 -2
30 -999 -2
#_male
#_age_sel:_6
31 2.5354 2 0.5 9 4 4 -1 99 40 0
32 -3 -3
33 7.49481e-010 3 0 9 2 2 -1 99 41 0 LO
34 9 -3
35 -999 -2
36 -999 -2
#_male
#_age_sel:_7
37 2.79823 2 0.5 9 4 4 -1 99 42 0
38 -3 -3
39 1.58835e-008 3 0 9 2 2 -1 99 43 0 LO
40 9 -3
41 -999 -2
42 -999 -2
#_male
#_age_sel:_8
43 1.67615 2 0.5 9 4 4 -1 99 44 0
44 -3 -3
45 0.021067 3 0 9 2 2 -1 99 45 0 LO
46 9 -3
47 -999 -2
48 -999 -2
#_male
#_age_sel:_9
49 2.5068 2 0.5 9 4 4 -1 99 46 0

```



```

50 -3 -3
51 7.19415e-010 3 0 9 2 2 -1 99 47 0 LO
52 9 -3
53 -999 -2
54 -999 -2
#_male
#_age_sel:_10
55 2.96626 2 0.5 9 4 4 -1 99 48 0
56 -3 -3
57 1.08417 3 0 9 2 2 -1 99 49 0
58 9 -3
59 -999 -2
60 -999 -2
#_male
#_age_sel:_11
61 0.999988 2 0.5 9 4 4 -1 99 50 0
62 -3 -3
63 0.0984456 3 0 9 2 2 -1 99 51 0
64 9 -3
65 -999 -2
66 -999 -2
#_male
#_age_sel:_12
67 0 -3
68 0 -3
#_male
#_age_sel:_13
69 0 -3
70 0 -3
#_male
#_age_sel:_14
71 0 -3
72 0 -3
#_male
sel_parm_env_linkages
sel_parm_blockparms
73 2.42671 2 0.5 9 4 4 -1 99 52 0
74 0.0967715 3 0 9 2 2 -1 99 53 0
SEL_parm_devs
1_YR1982 0
Forecast_Recr_Devs
2007 0 - - - - - 54

Selex_Block_Assignments_Years:
Base_parm# 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994
1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006
1 0 0 0 0 0 0 0 0 0 0 0 0 0 73 73 73 73 73 73 73 73 73 73
3 0 0 0 0 0 0 0 0 0 0 0 0 0 74 74 74 74 74 74 74 74 74 74

RECR_DIST
G_pattern gender Seas Area Value Used?
1 1 1 1 1 1

MOVEMENT
Seas Source Dist 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

SUBMORPHDIST 1

```

MGparm\_By\_Year\_after\_adjustments

```

Year
1982 0.2 0 28.1 60.2 0.2052 0.1 0 2.44e-006 3.34694 28.1 -0.25 1 0 0 0 4 1
1983 0.2 0 28.1 60.2 0.2052 0.1 0 2.44e-006 3.34694 28.1 -0.25 1 0 0 0 4 1
1984 0.2 0 28.1 60.2 0.2052 0.1 0 2.44e-006 3.34694 28.1 -0.25 1 0 0 0 4 1
1985 0.2 0 28.1 60.2 0.2052 0.1 0 2.44e-006 3.34694 28.1 -0.25 1 0 0 0 4 1
1986 0.2 0 28.1 60.2 0.2052 0.1 0 2.44e-006 3.34694 28.1 -0.25 1 0 0 0 4 1
1987 0.2 0 28.1 60.2 0.2052 0.1 0 2.44e-006 3.34694 28.1 -0.25 1 0 0 0 4 1
1988 0.2 0 28.1 60.2 0.2052 0.1 0 2.44e-006 3.34694 28.1 -0.25 1 0 0 0 4 1
1989 0.2 0 28.1 60.2 0.2052 0.1 0 2.44e-006 3.34694 28.1 -0.25 1 0 0 0 4 1
1990 0.2 0 28.1 60.2 0.2052 0.1 0 2.44e-006 3.34694 28.1 -0.25 1 0 0 0 4 1
1991 0.2 0 28.1 60.2 0.2052 0.1 0 2.44e-006 3.34694 28.1 -0.25 1 0 0 0 4 1
1992 0.2 0 28.1 60.2 0.2052 0.1 0 2.44e-006 3.34694 28.1 -0.25 1 0 0 0 4 1
1993 0.2 0 28.1 60.2 0.2052 0.1 0 2.44e-006 3.34694 28.1 -0.25 1 0 0 0 4 1
1994 0.2 0 28.1 60.2 0.2052 0.1 0 2.44e-006 3.34694 28.1 -0.25 1 0 0 0 4 1
1995 0.2 0 28.1 60.2 0.2052 0.1 0 2.44e-006 3.34694 28.1 -0.25 1 0 0 0 4 1
1996 0.2 0 28.1 60.2 0.2052 0.1 0 2.44e-006 3.34694 28.1 -0.25 1 0 0 0 4 1
1997 0.2 0 28.1 60.2 0.2052 0.1 0 2.44e-006 3.34694 28.1 -0.25 1 0 0 0 4 1
1998 0.2 0 28.1 60.2 0.2052 0.1 0 2.44e-006 3.34694 28.1 -0.25 1 0 0 0 4 1
1999 0.2 0 28.1 60.2 0.2052 0.1 0 2.44e-006 3.34694 28.1 -0.25 1 0 0 0 4 1
2000 0.2 0 28.1 60.2 0.2052 0.1 0 2.44e-006 3.34694 28.1 -0.25 1 0 0 0 4 1
2001 0.2 0 28.1 60.2 0.2052 0.1 0 2.44e-006 3.34694 28.1 -0.25 1 0 0 0 4 1
2002 0.2 0 28.1 60.2 0.2052 0.1 0 2.44e-006 3.34694 28.1 -0.25 1 0 0 0 4 1
2003 0.2 0 28.1 60.2 0.2052 0.1 0 2.44e-006 3.34694 28.1 -0.25 1 0 0 0 4 1
2004 0.2 0 28.1 60.2 0.2052 0.1 0 2.44e-006 3.34694 28.1 -0.25 1 0 0 0 4 1
2005 0.2 0 28.1 60.2 0.2052 0.1 0 2.44e-006 3.34694 28.1 -0.25 1 0 0 0 4 1
2006 0.2 0 28.1 60.2 0.2052 0.1 0 2.44e-006 3.34694 28.1 -0.25 1 0 0 0 4 1

```

SELParm(Size)\_By\_Year\_after\_adjustments  
Fleet/Svy Year

```

SELParm(Age)_By_Year_after_adjustments
Fleet/Svy Year
1 1982 1.94887 -3 0.195781 9 -999 -999
1 1995 2.42671 -3 0.0967715 9 -999 -999
2 1982 3.48574 -3 1.27732 9 -999 -999
3 1982 3.15264 -3 1.0745 9 -999 -999
4 1982 1.04469 -3 6.14273e-008 9 -999 -999
5 1982 2.72982 -3 3.25786e-009 9 -999 -999
6 1982 2.5354 -3 7.49481e-010 9 -999 -999
7 1982 2.79823 -3 1.58835e-008 9 -999 -999
8 1982 1.67615 -3 0.021067 9 -999 -999
9 1982 2.5068 -3 7.19415e-010 9 -999 -999
10 1982 2.96626 -3 1.08417 9 -999 -999
11 1982 0.999988 -3 0.0984456 9 -999 -999
12 1982 0 0
13 1982 0 0
14 1982 0 0

```

```

EXPLOITATION Hrate_is_Continuous_F Fleet_in_columns;_year_in_rows
yr seas 1
init_yr 1 1.6927
1982 1 1.18484
1983 1 1.71053
1984 1 1.78559
1985 1 1.71667

```

1986 1 2.25341  
 1987 1 1.72794  
 1988 1 2.13806  
 1989 1 1.68657  
 1990 1 1.78713  
 1991 1 1.90442  
 1992 1 2.11489  
 1993 1 1.86887  
 1994 1 1.6676  
 1995 1 2.12497  
 1996 1 1.70532  
 1997 1 1.01498  
 1998 1 0.950804  
 1999 1 0.781728  
 2000 1 0.94831  
 2001 1 0.86898  
 2002 1 0.733562  
 2003 1 0.695106  
 2004 1 0.675384  
 2005 1 0.605025  
 2006 1 0.442444  
 2007 1 0.0328236

TIME\_SERIES Bio-Smry\_age:\_1 Hrate\_is\_Continuous\_F  
 pop year period season bio-all bio-smry SpawnBio recruit-0 enc\_catch:\_1  
 dead\_catch:\_1 ret\_catch:\_1 obs\_cat:\_1 Hrate-1 SPB\_vir\_LH  
 1 1980 VIRG 1 358829 358524 357261 44821.4 0 0 0 0 0 357284  
 1 1981 INIT 1 26674.7 26278.1 25042.3 58202 23449 23449 23449 10000 1.6927  
 25042.3  
 1 1982 TIME 1 26580.2 26278.1 25042.3 44326.9 18908.3 18908.3 18908.3 18963  
 1.18484 25006.3  
 1 1983 TIME 1 28649.5 28156.3 26977.7 72362.1 26121.7 26121.7 26121.7 26466  
 1.71053 27165.1  
 1 1984 TIME 1 28444.7 28238.8 26610.1 30206.8 24933.7 24933.7 24933.7 26057  
 1.78559 26688.3  
 1 1985 TIME 1 21556.7 21190.4 20339.8 53752.2 20000.1 20000.1 20000.1 20432  
 1.71667 20479  
 1 1986 TIME 1 21024.9 20634.5 19437.3 57288.3 20918 20918 20918 20866 2.25341  
 19585.7  
 1 1987 TIME 1 21131 20830.2 19549.4 44138.1 18364 18364 18364 18312 1.72794  
 19663.7  
 1 1988 TIME 1 21358.9 21304.6 20217.4 7974.63 20975.3 20975.3 20975.3 21761  
 2.13806 20238.1  
 1 1989 TIME 1 9772.24 9624.45 9342.89 21685.5 9244.97 9244.97 9244.97 10314  
 1.68657 9399.05  
 1 1990 TIME 1 8369.74 8149.75 7680.44 32280.6 7391.75 7391.75 7391.75 7976  
 1.78713 7764.04  
 1 1991 TIME 1 11684.4 11501.4 10774.7 26851 10640.9 10640.9 10640.9 11316  
 1.90442 10844.2  
 1 1992 TIME 1 12060.8 11825.1 11183 34582.9 11944.4 11944.4 11944.4 11805  
 2.11489 11272.6  
 1 1993 TIME 1 12542.2 12338.4 11571.5 29912.3 11341.2 11341.2 11341.2 10781  
 1.86887 11648.9  
 1 1994 TIME 1 13227.5 13007.5 12295.2 32280 11561.9 11561.9 11561.9 12182  
 1.6676 12378.8  
 1 1995 TIME 1 14270.9 14025.7 13263.7 35983.4 9681.58 9681.58 9681.58 10495  
 2.12497 13356.8

1 1996 TIME 1 19099.3 18928.4 17968 25083.5 12296.1 12296.1 12296.1 11643  
 1.70532 18033  
 1 1997 TIME 1 20593.3 20426.5 19654.4 24474 11242.1 11242.1 11242.1 10325  
 1.01498 19717.8  
 1 1998 TIME 1 22588.8 22404.7 21694.1 27010.3 12186.6 12186.6 12186.6 11641  
 0.950804 21764  
 1 1999 TIME 1 24050.3 23908.3 23143.9 20830.7 11199.3 11199.3 11199.3 10851  
 0.781728 23197.9  
 1 2000 TIME 1 25541.2 25355.2 24702.4 27301.4 14451.5 14451.5 14451.5 13756  
 0.94831 24773.1  
 1 2001 TIME 1 24643.4 24440.5 23695.4 29777.3 12337.4 12337.4 12337.4 11932  
 0.86898 23772.5  
 1 2002 TIME 1 26850 26635.9 25788.1 31420.5 11882 11882 11882 11308 0.733562  
 25869.5  
 1 2003 TIME 1 30852.1 30694.7 29788 23100.3 13460.1 13460.1 13460.1 12927  
 0.695106 29847.9  
 1 2004 TIME 1 32334.8 32063 31324.8 39889 14687.2 14687.2 14687.2 14306  
 0.675384 31428.1  
 1 2005 TIME 1 35545.6 35400.7 34355.7 21256.6 13651.5 13651.5 13651.5 13446  
 0.605025 34410.7  
 1 2006 TIME 1 37454.6 37292.4 36527.5 23806.8 12564 12564 12564 12574  
 0.442444 36589.2  
 1 2007 FORE 1 39972.6 39695.9 39115.4 40598.4 1187.77 1187.77 1187.77 1187.77  
 0.0328236 39115.4

SPR\_series uses\_R0= 44821.4 ###note\_Y/R\_unit\_is\_Dead\_Biomass  
 Year Bio\_all Bio\_Smry SPBzero SPBfished SPBfished/R SPR Y/R GenTime Actual:  
 Bio\_all Bio\_Smry Enc\_Catch Dead\_Catch Retain\_Catch SPB Recruits Tot\_Exploit  
 More\_F(by\_morph): aveF-1 maxF-1  
 1982 26950.5 26645 357261 25626.1 0.571739 0.0717295 0.438324 0.255201 +  
 26580.2 26278.1 18908.3 18908.3 18908.3 25042.3 44326.9 0.71137 + 1.13793  
 1.18482  
 1983 20388.4 20082.9 357261 19133.4 0.42688 0.0535557 0.401905 0.152148 +  
 28649.5 28156.3 26121.7 26121.7 26121.7 26977.7 72362.1 0.911771 + 1.64279  
 1.71049  
 1984 19774.5 19469 357261 18528.3 0.413381 0.0518622 0.397902 0.141317 +  
 28444.7 28238.8 24933.7 24933.7 24933.7 26610.1 30206.8 0.876569 + 1.71489  
 1.78555  
 1985 20336.1 20030.6 357261 19081.8 0.42573 0.0534115 0.401569 0.151232 +  
 21556.7 21190.4 20000.1 20000.1 20000.1 20339.8 53752.2 0.927791 + 1.64869  
 1.71663  
 1986 16867.6 16562.1 357261 15671.6 0.349646 0.0438661 0.377277 0.0891874 +  
 21024.9 20634.5 20918 20918 20918 19437.3 57288.3 0.994919 + 2.16418  
 2.25336  
 1987 20241.2 19935.7 357261 18988.2 0.423642 0.0531495 0.400956 0.149564 +  
 21131 20830.2 18364 18364 18364 19549.4 44138.1 0.869056 + 1.65952 1.7279  
 1988 17468.1 17162.7 357261 16260.5 0.362785 0.0455145 0.381776 0.0999061 +  
 21358.9 21304.6 20975.3 20975.3 20975.3 20217.4 7974.63 0.982037 + 2.0534  
 2.13801  
 1989 20595.9 20290.5 357261 19338.1 0.431447 0.0541287 0.403232 0.155777 +  
 9772.24 9624.45 9244.97 9244.97 9244.97 9342.89 21685.5 0.946044 + 1.61979  
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Virg 357261 44821.4 44821.4 37438 44821.4
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N_est r.m.s.e.
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INDEX\_2

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8 1988 38959.5 1.42 1.65675 4.2525e-005 0.4 -0.154202 0.0743073 -0.841983  
8 1989 16712.5 0.14 0.710698 4.2525e-005 0.4 -1.6246 8.24794 7.33165  
8 1990 16523.7 0.87 0.702669 4.2525e-005 0.4 0.213607 0.142587 -0.773704  
8 1991 23619.2 1.26 1.00441 4.2525e-005 0.4 0.226715 0.160624 -0.755667  
8 1992 23956.7 1.02 1.01876 4.2525e-005 0.4 0.00121834 4.63863e-006 -0.916286  
8 1993 25304.6 1.109 1.07608 4.2525e-005 0.4 0.0301375 0.00283835 -0.913452  
8 1994 26007.6 0.55 1.10597 4.2525e-005 0.4 -0.698561 1.52496 0.608671  
8 1995 27799.8 0.541 1.18219 4.2525e-005 0.4 -0.781702 1.90956 0.993265  
8 1996 35888.3 2.191 1.52615 4.2525e-005 0.4 0.361611 0.408632 -0.507659  
8 1997 35783.6 2.5 1.52169 4.2525e-005 0.4 0.496466 0.770246 -0.146045  
8 1998 35871.4 1.719 1.52543 4.2525e-005 0.4 0.119465 0.0445999 -0.871691  
8 1999 36919.5 2.68 1.57 4.2525e-005 0.4 0.53474 0.893586 -0.0227052  
8 2000 37257.6 1.91 1.58438 4.2525e-005 0.4 0.186912 0.109176 -0.807115  
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14 1995 35983.4 0.3 0.216745 6.02348e-006 0.4 0.325061 0.330201 -0.58609  
14 1996 25083.5 0.08 0.15109 6.02348e-006 0.4 -0.635847 1.26344 0.347151  
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INDEX\_1

Index Do\_Power Power Do\_Env\_var Env\_Link Do\_ExtraVar Qtype Q Num=0/Bio=1  
Err\_type N Npos r.m.s.e. mean\_input\_SE mean\_(Input+extra)\_SE pen mean\_Qdev  
rmse\_Qdev  
1 0 1.0 0 0.00 0.0 0 -- 1 0 0 0 0 0 0 0  
2 0 1.0 0 0.00 0.0 0 0.000876068 0 0 15 15 0.438668 0.16 0.16 0 0  
3 0 1.0 0 0.00 0.0 0 7.65724e-005 0 0 25 25 0.421036 0.21 0.21 0 0  
4 0 1.0 0 0.00 0.0 0 3.7939e-005 0 0 25 25 0.464731 0.31 0.31 0 0

```

5 0 1.0 0 0.00 0.0 0 7.19837e-005 0 0 25 25 0.721046 0.21 0.21 0 0
6 0 1.0 0 0.00 0.0 0 4.74153e-005 0 0 25 25 0.896176 0.21 0.21 0 0
7 0 1.0 0 0.00 0.0 0 3.44968e-005 0 0 23 23 0.685782 0.4 0.4 0 0
8 0 1.0 0 0.00 0.0 0 4.2525e-005 0 0 23 23 0.612727 0.4 0.4 0 0
9 0 1.0 0 0.00 0.0 0 3.25614e-005 0 0 25 25 0.847081 0.4 0.4 0 0
10 0 1.0 0 0.00 0.0 0 3.26689e-005 0 0 17 17 0.819153 0.4 0.4 0 0
11 0 1.0 0 0.00 0.0 0 0.000139714 0 0 19 19 0.446808 0.4 0.4 0 0
12 0 1.0 0 0.00 0.0 0 3.16328e-005 0 0 25 25 0.601046 0.4 0.4 0 0
13 0 1.0 0 0.00 0.0 0 0.000267896 0 0 25 25 0.595197 0.4 0.4 0 0
14 0 1.0 0 0.00 0.0 0 6.02348e-006 0 0 21 21 0.877642 0.4 0.4 0 0
rmse_Qdev_not_in_logL
pen_mean_Qdev_not_in_logL_in_randwalk_approach

```

INDEX\_3

```

Index Q_parm_assignments
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8 0 -- 0 -- 0 0
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10 0 -- 0 -- 0 0
11 0 -- 0 -- 0 0
12 0 -- 0 -- 0 0
13 0 -- 0 -- 0 0
14 0 -- 0 -- 0 0

```

```

DISCARD log(L)_based_on_T-distribution_with_DF=_30
as_fraction
index year seas obs exp cv Dev Like Like+log(s)

```

```

MEAN_BODY_WT log(L)_based_on_T-distribution_with_DF=_30
year seas index Mkt obs exp cv Dev Like Like+log(s)
1982 1 1 0 0.504 0.5898 0.1 -0.0858002 1.42938 1.42938
1983 1 1 0 0.521 0.610447 0.1 -0.0894474 1.45265 1.45265
1984 1 1 0 0.518 0.559585 0.1 -0.0415851 0.32946 0.32946
1985 1 1 0 0.575 0.617058 0.1 -0.0420578 0.273983 0.273983
1986 1 1 0 0.613 0.513437 0.1 0.0995635 1.30635 1.30635
1987 1 1 0 0.581 0.52464 0.1 0.0563597 0.478708 0.478708
1988 1 1 0 0.588 0.592399 0.1 -0.00439887 0.00289133 0.00289133
1989 1 1 0 0.668 0.687625 0.1 -0.0196249 0.0445296 0.0445296
1990 1 1 0 0.54 0.515437 0.1 0.0245625 0.106531 0.106531
1991 1 1 0 0.537 0.510453 0.1 0.0265472 0.125758 0.125758
1992 1 1 0 0.595 0.527739 0.1 0.0672609 0.646565 0.646565
1993 1 1 0 0.571 0.513394 0.1 0.0576057 0.517134 0.517134
1994 1 1 0 0.605 0.548861 0.1 0.0561388 0.438598 0.438598
1995 1 1 0 0.675 0.652766 0.1 0.0222343 0.0559584 0.0559584
1996 1 1 0 0.621 0.687349 0.1 -0.0663486 0.578836 0.578836
1997 1 1 0 0.697 0.784303 0.1 -0.0873029 0.790108 0.790108
1998 1 1 0 0.759 0.870746 0.1 -0.111746 1.08132 1.08132
1999 1 1 0 0.755 0.903129 0.1 -0.148129 1.8712 1.8712
2000 1 1 0 0.85 0.942084 0.1 -0.0920844 0.594819 0.594819
2001 1 1 0 0.903 0.942133 0.1 -0.0391327 0.0967294 0.0967294

```

2002 1 1 0 0.898 0.918153 0.1 -0.0201526 0.025999 0.025999  
 2003 1 1 0 0.999 0.938836 0.1 0.0601637 0.186267 0.186267  
 2004 1 1 0 0.983 0.989492 0.1 -0.00649183 0.00225323 0.00225323  
 2005 1 1 0 0.949 1.005 0.1 -0.0560018 0.178885 0.178885  
 2006 1 1 0 0.947 1.025 0.1 -0.0779964 0.346574 0.346574

FIT\_LEN\_COMPS

Index Year Seas Gender Mkt Nsamp effN Like

index N Npos mean\_effN mean(inputN) HarMean(effN) Mean(effN/inputN)  
 MeaneffN/MeainputN  
 1 0 0 0 0 0 0 -1.#IND  
 2 0 0 0 0 0 0 -1.#IND  
 3 0 0 0 0 0 0 -1.#IND  
 4 0 0 0 0 0 0 -1.#IND  
 5 0 0 0 0 0 0 -1.#IND  
 6 0 0 0 0 0 0 -1.#IND  
 7 0 0 0 0 0 0 -1.#IND  
 8 0 0 0 0 0 0 -1.#IND  
 9 0 0 0 0 0 0 -1.#IND  
 10 0 0 0 0 0 0 -1.#IND  
 11 0 0 0 0 0 0 -1.#IND  
 12 0 0 0 0 0 0 -1.#IND  
 13 0 0 0 0 0 0 -1.#IND  
 14 0 0 0 0 0 0 -1.#IND

FIT\_AGE\_COMPS

Index Year Seas Gender Mkt Ageerr Lbin\_lo Lbin\_hi Nsamp effN Like

1 1982 1 0 0 1 1 70 82 64.8368 3.99756  
 1 1983 1 0 0 1 1 70 69 16.1371 4.31202  
 1 1984 1 0 0 1 1 70 53 12.7667 3.16884  
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 1 1990 1 0 0 1 1 70 34 156.495 0.488038  
 1 1991 1 0 0 1 1 70 46 15.2244 3.77918  
 1 1992 1 0 0 1 1 70 34 81.0315 1.70277  
 1 1993 1 0 0 1 1 70 36 32.5246 1.36151  
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 1 1997 1 0 0 1 1 70 89 18.3428 9.56086  
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 1 2001 1 0 0 1 1 70 103 77.432 2.22418  
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 1 2005 1 0 0 1 1 70 172 31.5286 20.6796  
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 2 1993 1 0 0 1 1 70 100 14.4874 6.89405  
 2 1994 1 0 0 1 1 70 100 10.6153 6.7324  
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2	1997	1	0	0	1	1	70	100	20.1382	9.40423
2	1998	1	0	0	1	1	70	100	617.382	1.47669
2	1999	1	0	0	1	1	70	100	138.907	3.49433
2	2000	1	0	0	1	1	70	100	25.3774	12.6108
2	2001	1	0	0	1	1	70	100	47.746	4.52875
2	2002	1	0	0	1	1	70	100	30.1272	5.39143
2	2003	1	0	0	1	1	70	100	597.811	0.882789
2	2004	1	0	0	1	1	70	100	33.8562	6.68653
2	2005	1	0	0	1	1	70	100	113.17	4.71701
2	2006	1	0	0	1	1	70	100	475.268	2.86737
3	1982	1	0	0	1	1	70	100	9.97462	8.04422
3	1983	1	0	0	1	1	70	100	80.0969	5.52988
3	1984	1	0	0	1	1	70	100	6.29528	23.5355
3	1985	1	0	0	1	1	70	100	47.6616	1.70478
3	1986	1	0	0	1	1	70	100	20.3029	4.25291
3	1987	1	0	0	1	1	70	100	72.3373	1.25364
3	1988	1	0	0	1	1	70	100	238.773	1.3944
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3	1996	1	0	0	1	1	70	100	6.02898	10.0741
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3	1998	1	0	0	1	1	70	100	590.544	2.37646
3	1999	1	0	0	1	1	70	100	41.2788	4.35892
3	2000	1	0	0	1	1	70	100	43.6019	6.21563
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3	2002	1	0	0	1	1	70	100	22.9811	9.58721
3	2003	1	0	0	1	1	70	100	113.341	2.57241
3	2004	1	0	0	1	1	70	100	62.1463	3.99562
3	2005	1	0	0	1	1	70	100	43.765	5.15281
3	2006	1	0	0	1	1	70	100	21.9337	12.4156
4	1982	1	0	0	1	1	70	100	109.989	2.07031
4	1983	1	0	0	1	1	70	100	25.3133	5.68669
4	1984	1	0	0	1	1	70	100	115.311	1.59018
4	1985	1	0	0	1	1	70	100	86.9293	1.37598
4	1986	1	0	0	1	1	70	100	224.234	1.71442
4	1987	1	0	0	1	1	70	100	23.526	10.2368
4	1988	1	0	0	1	1	70	100	42.8965	2.00221
4	1989	1	0	0	1	1	70	100	2.88187	34.518
4	1990	1	0	0	1	1	70	100	18.0069	5.00209
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4	1992	1	0	0	1	1	70	100	20.7203	5.91734
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4	2002	1	0	0	1	1	70	100	20.9918	13.4484

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4	2005	1	0	0	1	1	70	100	112.819	2.28605
4	2006	1	0	0	1	1	70	100	147.02	1.44193
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5	1985	1	0	0	1	1	70	100	8.40679	8.4994
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5	1988	1	0	0	1	1	70	100	96.6583	0.557778
5	1989	1	0	0	1	1	70	100	3451.76	0.0142239
5	1990	1	0	0	1	1	70	100	2.11331	24.6237
5	1991	1	0	0	1	1	70	100	11.6444	3.52532
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5	1993	1	0	0	1	1	70	100	103.466	0.517966
5	1994	1	0	0	1	1	70	100	14.9946	4.41364
5	1995	1	0	0	1	1	70	100	6.55392	10.5662
5	1996	1	0	0	1	1	70	100	115.642	0.403225
5	1997	1	0	0	1	1	70	100	27.0035	2.07654
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5	2000	1	0	0	1	1	70	100	159.958	0.31413
5	2001	1	0	0	1	1	70	100	26.6128	1.88426
5	2002	1	0	0	1	1	70	100	5.42987	10.0385
5	2003	1	0	0	1	1	70	100	9.89586	5.23421
5	2004	1	0	0	1	1	70	100	261.671	0.191135
5	2005	1	0	0	1	1	70	100	9.22586	5.75194
5	2006	1	0	0	1	1	70	100	8.09588	6.43516
6	1982	1	0	0	1	1	70	100	6.76727	11.6955
6	1983	1	0	0	1	1	70	100	10450.8	0.0046515
6	1984	1	0	0	1	1	70	100	11.7387	3.79539
6	1985	1	0	0	1	1	70	100	11.0762	6.57648
6	1986	1	0	0	1	1	70	100	18676.7	0.00253149
6	1987	1	0	0	1	1	70	100	21.3414	3.35008
6	1988	1	0	0	1	1	70	100	10.6815	7.16627
6	1989	1	0	0	1	1	70	100	9.44955	7.0074
6	1990	1	0	0	1	1	70	100	1.01186	119.898
6	1991	1	0	0	1	1	70	100	23.1712	2.98093
6	1992	1	0	0	1	1	70	100	3.1402	36.9882
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6	1997	1	0	0	1	1	70	100	147.564	0.322861
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6	2001	1	0	0	1	1	70	100	5.34373	10.0966
6	2002	1	0	0	1	1	70	100	4.3416	13.6832
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6	2004	1	0	0	1	1	70	100	2.04533	29.7045
6	2005	1	0	0	1	1	70	100	21.9946	2.28833
6	2006	1	0	0	1	1	70	100	3.42019	17.0711
7	1984	1	0	0	1	1	70	100	8.25813	6.9848
7	1985	1	0	0	1	1	70	100	19.3368	8.20328
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7	1990	1	0	0	1	1	70	100	32.3509	4.5862
7	1991	1	0	0	1	1	70	100	11.0733	5.12683
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7	1997	1	0	0	1	1	70	100	18.6303	8.11398
7	1998	1	0	0	1	1	70	100	143.882	1.33458
7	1999	1	0	0	1	1	70	100	857.203	0.191224
7	2000	1	0	0	1	1	70	100	38.5714	5.03445
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7	2004	1	0	0	1	1	70	100	36.331	2.29212
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8	1993	1	0	0	1	1	70	100	26.9083	3.74674
8	1994	1	0	0	1	1	70	100	9.94617	17.6834
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8	1997	1	0	0	1	1	70	100	37.3177	6.77101
8	1998	1	0	0	1	1	70	100	5.96955	16.5325
8	1999	1	0	0	1	1	70	100	14.5464	6.87929
8	2000	1	0	0	1	1	70	100	80.5006	3.64965
8	2001	1	0	0	1	1	70	100	11.7926	12.9252
8	2002	1	0	0	1	1	70	100	28.9198	5.37934
8	2003	1	0	0	1	1	70	100	231.586	1.10884
8	2004	1	0	0	1	1	70	100	52.3915	5.80277
8	2005	1	0	0	1	1	70	100	174.299	1.88069
8	2006	1	0	0	1	1	70	100	83.9928	4.4076
9	1982	1	0	0	1	1	70	100	208.647	0.251776
9	1983	1	0	0	1	1	70	100	985.747	0.0497684
9	1984	1	0	0	1	1	70	100	214.121	0.242147
9	1985	1	0	0	1	1	70	100	45.6547	1.26301
9	1986	1	0	0	1	1	70	100	292.347	0.175495
9	1987	1	0	0	1	1	70	100	202.589	0.26908
9	1988	1	0	0	1	1	70	100	3.24286	36.6722
9	1989	1	0	0	1	1	70	100	4.83745	26.0097
9	1990	1	0	0	1	1	70	100	1.08339	112.256
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9	1992	1	0	0	1	1	70	100	4.68037	7.78725
9	1993	1	0	0	1	1	70	100	5.16502	7.41111
9	1994	1	0	0	1	1	70	100	2.90925	39.3783
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9 1996 1 0 0 1 1 70 100 14.5063 5.37061  
 9 1997 1 0 0 1 1 70 100 8.48157 8.34783  
 9 1998 1 0 0 1 1 70 100 9.5999 5.71063  
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 11 2003 1 0 0 1 1 70 100 20.1215 9.14835  
 11 2004 1 0 0 1 1 70 100 5.79483 24.2037  
 11 2005 1 0 0 1 1 70 100 16.497 14.5249  
 11 2006 1 0 0 1 1 70 100 8.65758 17.1867

index N Npos mean\_effN mean(inputN) HarMean(effN) Mean(effN/inputN)  
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 1 0 25 47.1377 80.6 27.6866 0.8483 0.584835  
 2 0 15 147.655 100 21.9047 1.47655 1.47655  
 3 0 25 71.9399 100 18.6871 0.719399 0.719399  
 4 0 25 52.1643 100 19.9406 0.521643 0.521643  
 5 0 25 180.32 100 11.3793 1.8032 1.8032  
 6 0 25 1448.23 100 5.74022 14.4823 14.4823  
 7 0 23 95.0143 100 17.3944 0.950143 0.950143







6 2006 1 2006-6 0.00161586 0.0946661 0.751006 0.99966 0.999994 0.999893  
0.999541 0.998942 0.998098 0.997007 0.995673 0.994094 0.992273 0.990211  
0.98791 0.98537  
7 1982 1 1982-7 0.000397994 0.039417 0.528854 0.998658 0.999986 0.999942  
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7 2006 1 2006-7 0.000397994 0.039417 0.528854 0.998658 0.999986 0.999942  
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0.988508 0.986028  
8 1982 1 1982-8 0.063872 0.639238 0.999273 0.999991 0.99993 0.999623 0.999069  
0.998269 0.997224 0.995933 0.994399 0.992622 0.990603 0.988345 0.985849  
0.983116  
8 2006 1 2006-8 0.063872 0.639238 0.999273 0.999991 0.99993 0.999623 0.999069  
0.998269 0.997224 0.995933 0.994399 0.992622 0.990603 0.988345 0.985849  
0.983116  
9 1982 1 1982-9 0.0018665 0.103273 0.773762 0.999708 0.999994 0.999887  
0.999528 0.998923 0.998071 0.996974 0.995633 0.994048 0.99222 0.990152  
0.987844 0.985298  
9 2006 1 2006-9 0.0018665 0.103273 0.773762 0.999708 0.999994 0.999887  
0.999528 0.998923 0.998071 0.996974 0.995633 0.994048 0.99222 0.990152  
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10 1982 1 1982-10 0.0510192 0.270505 0.729261 0.999868 0.999988 0.999966  
0.999716 0.999218 0.998474 0.997485 0.99625 0.994771 0.99305 0.991087  
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0.999716 0.999218 0.998474 0.997485 0.99625 0.994771 0.99305 0.991087  
0.988883 0.986441  
11 1982 1 1982-11 0.404074 1 0.999973 0.99998 0.999761 0.999295 0.998582  
0.997624 0.99642 0.994973 0.993282 0.991349 0.989176 0.986765 0.984116  
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11 2006 1 2006-11 0.404074 1 0.999973 0.99998 0.999761 0.999295 0.998582  
0.997624 0.99642 0.994973 0.993282 0.991349 0.989176 0.986765 0.984116  
0.981232  
12 1982 1 1982-12 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
12 2006 1 2006-12 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
13 1982 1 1982-13 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
13 2006 1 2006-13 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
14 1982 1 1982-14 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
14 2006 1 2006-14 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

AGE\_SELEX\_from\_size\_selex\_in\_endyear

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2	2006	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3	2006	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4	2006	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
5	2006	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
6	2006	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
7	2006	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
8	2006	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
9	2006	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
10	2006	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
11	2006	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
12	2006	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
13	2006	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
14	2006	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

AGE\_SELEX\_mortality\_in\_endyear

```

fleet year morph season label 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
1 2006 1 1 sel*wt 0.000854034 0.0702472 0.684762 1.22432 1.6606 2.08789
2.48716 2.84561 3.15546 3.41444 3.62515 3.79322 3.9253 4.02784 4.10649
4.16593
1 2006 1 1 sel*ret*wt 0.000854034 0.0702472 0.684762 1.22432 1.6606 2.08789
2.48716 2.84561 3.15546 3.41444 3.62515 3.79322 3.9253 4.02784 4.10649
4.16593
1 2006 1 1 sel_nums 0.00476902 0.157596 0.848032 0.999824 0.999996 0.999868
0.999491 0.998866 0.997996 0.996881 0.99552 0.993917 0.992071 0.989984
0.987658 0.985094
1 2006 1 1 sel*ret_nums 0.00476902 0.157596 0.848032 0.999824 0.999996
0.999868 0.999491 0.998866 0.997996 0.996881 0.99552 0.993917 0.992071
0.989984 0.987658 0.985094
1 2006 1 1 dead_nums 0.00476902 0.157596 0.848032 0.999824 0.999996 0.999868
0.999491 0.998866 0.997996 0.996881 0.99552 0.993917 0.992071 0.989984
0.987658 0.985094
1 2006 1 1 dead*wt 0.000854034 0.0702472 0.684762 1.22432 1.6606 2.08789
2.48716 2.84561 3.15546 3.41444 3.62515 3.79322 3.9253 4.02784 4.10649
4.16593

```

ENVIRONMENTAL\_DATA Begins\_in\_startyr-1

NUMBERS\_AT\_AGE

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Population 1 gmorph 1 gender: 1 GrowPattern: 1 birthseason: 1
Year Per Seas 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
1980 VIRG 1 44821.4 36696.6 30044.7 24598.5 20139.5 16488.9 13499.9 11052.8
9049.28 7408.93 6065.92 4966.35 4066.1 3329.04 2725.59 12285.6
1981 INIT 1 58202 44228.9 16150.2 2435.68 366.981 55.2936 8.3346 1.25734
0.189918 0.0287341 0.00435645 0.000662139 0.000100931 1.54362e-005 2.36956e-
006 4.32162e-007
1982 TIME 1 44326.9 44228.9 16150.2 2435.68 366.981 55.2936 8.3346 1.25734
0.189918 0.0287341 0.00435645 0.000662139 0.000100931 1.54362e-005 2.36956e-
006 4.32162e-007
1983 TIME 1 72362.1 34446.8 20577.4 4046.24 609.82 91.8821 13.848 2.08857
0.315353 0.0476884 0.00722566 0.00109741 0.000167135 2.55358e-005 3.91556e-
006 7.13091e-007
1984 TIME 1 30206.8 54946.3 12471.8 3048.57 598.876 90.2596 13.6051 2.05221
0.309907 0.0468716 0.00710292 0.00107893 0.000164346 2.51137e-005 3.85145e-
006 7.01526e-007
1985 TIME 1 53752.2 22861.1 19194.1 1714.17 418.583 82.2298 12.3986 1.87052
0.282523 0.042739 0.00647819 0.000984287 0.000149971 2.2924e-005 3.51677e-006
6.40821e-007
1986 TIME 1 57288.3 40804.4 8252.85 2826.23 252.157 61.5752 12.1014 1.82618
0.275856 0.0417355 0.00632689 0.000961428 0.000146509 2.23979e-005 3.43658e-
006 6.26327e-007
1987 TIME 1 44138.1 42472.8 11403 710.685 243.067 21.6869 5.29871 1.0425
0.157583 0.0238565 0.00361936 0.000550498 8.39769e-005 1.28535e-005 1.97476e-
006 3.6052e-007
1988 TIME 1 7974.63 33489.5 15250.5 1660.23 103.371 35.3554 3.1558 0.771702
0.152023 0.0230185 0.00349219 0.00053116 8.10282e-005 1.24025e-005 1.90553e-
006 3.47914e-007
1989 TIME 1 21685.5 5942.39 9888.21 1473.75 160.244 9.97754 3.41432 0.305079
0.07472 0.0147506 0.00223932 0.000340802 5.20261e-005 7.96981e-006 1.22563e-
006 2.24049e-007

```

1990 TIME 1 32280.6 16483.7 2176.23 1500.45 223.416 24.2929 1.5132 0.518247  
 0.0463644 0.0113744 0.00225009 0.000342439 5.22667e-005 8.00528e-006  
 1.23087e-006 2.24968e-007  
 1991 TIME 1 26851 24428.9 5753.92 298.648 205.702 30.6293 3.33189 0.207725  
 0.071236 0.00638425 0.00156966 0.000311328 4.75262e-005 7.27934e-006  
 1.11931e-006 2.04595e-007  
 1992 TIME 1 34582.9 20215.3 8063.36 702.287 36.4118 25.08 3.73617 0.406804  
 0.0253976 0.00872601 0.000783864 0.000193265 3.84577e-005 5.89272e-006  
 9.0634e-007 1.65734e-007  
 1993 TIME 1 29912.3 25796.2 6035.16 797.466 69.3727 3.59687 2.47876 0.369643  
 0.0403104 0.00252189 0.000868713 7.82804e-005 1.93704e-005 3.87049e-006  
 5.95821e-007 1.09054e-007  
 1994 TIME 1 32280 22555.3 8660.28 763.252 100.747 8.76425 0.454619 0.313584  
 0.0468275 0.00511602 0.000320802 0.000110811 1.00173e-005 2.48784e-006  
 4.99151e-007 9.13882e-008  
 1995 TIME 1 35983.4 24557.4 8335.31 1339.28 117.922 15.5656 1.35464  
 0.0703254 0.0485682 0.00726458 0.000795298 4.9992e-005 1.73175e-005 1.57062e-  
 006 3.91502e-007 9.33735e-008  
 1996 TIME 1 25083.5 29163.7 14384.1 1125.76 131.013 11.5313 1.52253 0.13261  
 0.00689349 0.0047696 0.000715104 7.85135e-005 4.95217e-006 1.7222e-006  
 1.56889e-007 4.87256e-008  
 1997 TIME 1 24474 20370.3 18250.1 2773.09 167.536 19.4916 1.71597 0.226712  
 0.0197672 0.00102909 0.000713384 0.000107206 1.18027e-005 7.4679e-007  
 2.60635e-007 3.12736e-008  
 1998 TIME 1 27010.3 19940.8 14212.5 6318.24 822.972 49.7112 5.78428 0.50942  
 0.0673469 0.00587722 0.000306318 0.000212638 3.20068e-005 3.53036e-006  
 2.2385e-007 8.77307e-008  
 1999 TIME 1 20830.7 22014.1 14054.3 5195.58 1999.31 260.375 15.7297 1.83093  
 0.161345 0.021348 0.00186497 9.73271e-005 6.76651e-005 1.0203e-005 1.12763e-  
 006 9.98107e-008  
 2000 TIME 1 27301.4 16991.2 15934.5 5929.83 1946.86 749.072 97.5628 5.89569  
 0.68659 0.0605449 0.00801784 0.000701187 3.66387e-005 2.55092e-005 3.85274e-  
 006 4.64411e-007  
 2001 TIME 1 29777.3 22251.6 11980.1 5837.42 1881.09 617.493 237.615 30.9592  
 1.87196 0.218182 0.0192601 0.00255386 0.000223684 1.17085e-005 8.16804e-006  
 1.38576e-006  
 2002 TIME 1 31420.5 24278.8 15886.5 4694.19 2004.64 645.892 212.046 81.6231  
 10.6406 0.643874 0.0751179 0.0066389 0.000881538 7.73348e-005 4.05535e-006  
 3.31683e-006  
 2003 TIME 1 23100.3 25635.1 17707.6 6982.34 1845.76 788.127 253.958 83.3971  
 32.1169 4.18951 0.25372 0.0296299 0.00262176 0.000348599 3.06285e-005  
 2.92722e-006  
 2004 TIME 1 39889 18850.3 18810.5 8040.77 2853.08 754.116 322.03 103.795  
 34.0999 13.1401 1.7154 0.103984 0.012157 0.00107708 0.00014342 1.38299e-005  
 2005 TIME 1 21256.6 32553.4 13875.1 8685.64 3351 1188.89 314.269 134.237  
 43.2846 14.2288 5.48706 0.716976 0.0435087 0.00509305 0.000451867 6.6085e-005  
 2006 TIME 1 23806.8 17353.3 24228.5 6800.61 3883.56 1498.16 531.567 140.546  
 60.0553 19.375 6.37337 2.45979 0.321725 0.0195453 0.00229082 0.000233346  
 2007 FORE 1 40598.4 19450.3 13250.7 13630.7 3577.43 2042.78 788.086 279.67  
 73.965 31.6174 10.2054 3.35907 1.29735 0.169824 0.0103266 0.00133514

CATCH AT AGE

fleet 1 fleetarea 1 gmorph 1  
 Year Seas 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15  
 1981 E 3793.85 22504.5 12264.6 1850.09 278.751 41.9957 6.3289 0.954482  
 0.144114 0.0217931 0.00330212 0.000501538 7.63888e-005 1.16721e-005 1.78994e-  
 006 3.26086e-007

1982 1 2044.24 17469.7 10355 1562.16 235.368 35.4586 5.34338 0.805773  
 0.121645 0.0183923 0.00278627 0.000423091 6.44236e-005 9.84092e-006 1.50862e-  
 006 2.74737e-007  
 1983 1 4764.73 17649 15692.8 3086.48 465.17 70.0807 10.5601 1.59221 0.240313  
 0.0363227 0.00550027 0.000834782 0.000127035 1.93917e-005 2.97047e-006  
 5.40376e-007  
 1984 1 2073 28953.7 9673.46 2365.08 464.605 70.0165 10.5518 1.5912 0.240197  
 0.0363111 0.00549945 0.000834807 0.000127063 1.93997e-005 2.9723e-006  
 5.40819e-007  
 1985 1 3551.6 11740.7 14659 1309.45 319.753 62.8089 9.46848 1.42804 0.215606  
 0.0325999 0.00493841 0.000749815 0.000114155 1.74336e-005 2.67182e-006  
 4.8632e-007  
 1986 1 4913.17 24789.1 6927 2372.58 211.682 51.6877 10.1567 1.53239 0.23141  
 0.0349983 0.00530326 0.000805466 0.00012267 1.87412e-005 2.87341e-006  
 5.23262e-007  
 1987 1 2934.81 21906.8 8731.54 544.311 186.163 16.6083 4.05706 0.79798  
 0.120574 0.0182448 0.00276634 0.000420465 6.40901e-005 9.80086e-006 1.50427e-  
 006 2.74326e-007  
 1988 1 650.478 19731.8 12597.6 1371.67 85.4046 29.2081 2.6067 0.63728  
 0.125504 0.0189957 0.00288053 0.000437888 6.67579e-005 1.0211e-005 1.5676e-  
 006 2.85966e-007  
 1989 1 1408.6 3016.32 7498.08 1117.78 121.538 7.56679 2.58884 0.231251  
 0.0566152 0.0111709 0.00169485 0.000257757 3.93168e-005 6.0174e-006 9.24439e-  
 007 1.68801e-007  
 1990 1 2217.16 8690.84 1688.5 1164.44 173.383 18.8508 1.17399 0.401959  
 0.0359473 0.0088146 0.00174271 0.000265045 4.04231e-005 6.18597e-006  
 9.50224e-007 1.7349e-007  
 1991 1 1960.43 13412.6 4571.27 237.314 163.456 24.3366 2.6469 0.164976  
 0.0565558 0.00506635 0.00124497 0.000246774 3.76447e-005 5.76121e-006  
 8.85075e-007 1.61621e-007  
 1992 1 2791.67 11834.1 6637.8 578.231 29.9797 20.6481 3.07547 0.334786  
 0.0208948 0.00717614 0.000644334 0.000158775 3.15746e-005 4.8346e-006  
 7.43002e-007 1.35746e-007  
 1993 1 2144.78 13996 4761.99 629.365 54.7492 2.83841 1.95572 0.291567  
 0.0317844 0.00198759 0.000684291 6.16227e-005 1.52374e-005 3.04215e-006  
 4.67876e-007 8.55495e-008  
 1994 1 2074.03 11363.1 6536.59 576.22 76.0588 6.61593 0.343112 0.236598  
 0.0353168 0.00385648 0.000241675 8.3419e-005 7.5349e-006 1.86961e-006  
 3.74726e-007 6.85299e-008  
 1995 1 328.891 6369.35 6489.33 1104.31 97.2387 12.8349 1.11686 0.0579697  
 0.040024 0.00598446 0.000654871 4.11438e-005 1.4244e-005 1.29099e-006  
 3.21558e-007 7.66277e-008  
 1996 1 184.166 6257.1 10200.4 857.627 99.8148 8.78494 1.15974 0.100985  
 0.00524771 0.00362924 0.000543831 5.96699e-005 3.76078e-006 1.30676e-006  
 1.18929e-007 3.68971e-008  
 1997 1 107.119 2736.38 9682.14 1629.06 98.4297 11.4507 1.00785 0.133107  
 0.0115997 0.000603486 0.000418007 6.2757e-005 6.90152e-006 4.36132e-007  
 1.52e-007 1.82101e-008  
 1998 1 110.762 2521.3 7224.83 3568.22 464.822 28.0751 3.266 0.287526  
 0.0379914 0.00331315 0.000172535 0.000119651 1.79895e-005 1.98167e-006  
 1.2547e-007 4.90948e-008  
 1999 1 70.2586 2317.44 6241.45 2586.79 995.539 129.64 7.8298 0.911002  
 0.0802323 0.0106078 0.000925847 4.82647e-005 3.35132e-005 5.04618e-006  
 5.56815e-007 4.91992e-008  
 2000 1 111.663 2143.12 8086.1 3343.47 1097.83 422.367 54.9985 3.32226  
 0.386691 0.0340757 0.00450879 0.000393917 2.05595e-005 1.42957e-005 2.15599e-  
 006 2.59466e-007



2001 1 111.622 2587.03 5730.64 3115.59 1004.1 329.582 126.794 16.5136  
 0.997944 0.116229 0.0102512 0.00135789 0.00011879 6.20952e-006 4.3253e-006  
 7.32587e-007  
 2002 1 99.4579 2407 6737.9 2238.11 955.891 307.96 101.077 38.8909 5.06686  
 0.306365 0.0357085 0.0031524 0.00041805 3.66209e-005 1.91724e-006 1.56526e-  
 006  
 2003 1 69.294 2415.17 7217.93 3206.5 847.733 361.943 116.598 38.2726 14.7301  
 1.91996 0.116162 0.0135502 0.00119741 0.000158975 1.39446e-005 1.33026e-006  
 2004 1 116.266 1728.11 7504.41 3618.14 1283.97 339.344 144.871 46.6732  
 15.3242 5.90033 0.769521 0.0465933 0.00544011 0.000481256 6.3975e-005  
 6.15762e-006  
 2005 1 55.5117 2687.56 5090.25 3608.89 1392.52 494.001 130.547 55.7361  
 17.9605 5.89922 2.27263 0.296604 0.0179743 0.00210076 0.00018606 2.71587e-005  
 2006 1 45.482 1060.55 6912.96 2219.64 1267.73 489 173.451 45.8373 19.5726  
 6.30884 2.073 0.799039 0.104353 0.00632888 0.00074038 7.52585e-005

BIOLOGY 1 70 15 1 N\_Used\_morphs;\_lengths;\_ages;\_season;\_by\_season\_in\_endyr  
 bin low Mean\_Size Wt\_len-F mat\_len spawn Wt\_len-M

1 10 10.5 0.0063863 1 0.0063863  
 2 11 11.5 0.00865928 1 0.00865928  
 3 12 12.5 0.0114467 1 0.0114467  
 4 13 13.5 0.0148098 1 0.0148098  
 5 14 14.5 0.0188113 1 0.0188113  
 6 15 15.5 0.0235157 1 0.0235157  
 7 16 16.5 0.0289892 1 0.0289892  
 8 17 17.5 0.0352991 1 0.0352991  
 9 18 18.5 0.0425145 1 0.0425145  
 10 19 19.5 0.0507059 1 0.0507059  
 11 20 20.5 0.0599448 1 0.0599448  
 12 21 21.5 0.0703042 1 0.0703042  
 13 22 22.5 0.0818585 1 0.0818585  
 14 23 23.5 0.0946829 1 0.0946829  
 15 24 24.5 0.108854 1 0.108854  
 16 25 25.5 0.12445 1 0.12445  
 17 26 26.5 0.14155 1 0.14155  
 18 27 27.5 0.160232 1 0.160232  
 19 28 28.5 0.180579 1 0.180579  
 20 29 29.5 0.202673 1 0.202673  
 21 30 30.5 0.226596 1 0.226596  
 22 31 31.5 0.252433 1 0.252433  
 23 32 32.5 0.280267 1 0.280267  
 24 33 33.5 0.310187 1 0.310187  
 25 34 34.5 0.342277 1 0.342277  
 26 35 35.5 0.376627 1 0.376627  
 27 36 36.5 0.413324 1 0.413324  
 28 37 37.5 0.452458 1 0.452458  
 29 38 38.5 0.494119 1 0.494119  
 30 39 39.5 0.538399 1 0.538399  
 31 40 40.5 0.58539 1 0.58539  
 32 41 41.5 0.635184 1 0.635184  
 33 42 42.5 0.687876 1 0.687876  
 34 43 43.5 0.743558 1 0.743558  
 35 44 44.5 0.802328 1 0.802328  
 36 45 45.5 0.86428 1 0.86428  
 37 46 46.5 0.929512 1 0.929512  
 38 47 47.5 0.99812 1 0.99812  
 39 48 48.5 1.0702 1 1.0702

40 49 49.5 1.14586 1 1.14586  
41 50 50.5 1.22519 1 1.22519  
42 51 51.5 1.3083 1 1.3083  
43 52 52.5 1.39527 1 1.39527  
44 53 53.5 1.48623 1 1.48623  
45 54 54.5 1.58127 1 1.58127  
46 55 55.5 1.68048 1 1.68048  
47 56 56.5 1.78398 1 1.78398  
48 57 57.5 1.89188 1 1.89188  
49 58 58.5 2.00426 1 2.00426  
50 59 59.5 2.12125 1 2.12125  
51 60 60.5 2.24294 1 2.24294  
52 61 61.5 2.36945 1 2.36945  
53 62 62.5 2.50088 1 2.50088  
54 63 63.5 2.63734 1 2.63734  
55 64 64.5 2.77893 1 2.77893  
56 65 65.5 2.92577 1 2.92577  
57 66 66.5 3.07797 1 3.07797  
58 67 67.5 3.23564 1 3.23564  
59 68 68.5 3.39888 1 3.39888  
60 69 69.5 3.56782 1 3.56782  
61 70 70.5 3.74255 1 3.74255  
62 71 71.5 3.9232 1 3.9232  
63 72 72.5 4.10988 1 4.10988  
64 73 73.5 4.30271 1 4.30271  
65 74 74.5 4.50178 1 4.50178  
66 75 75.5 4.70723 1 4.70723  
67 76 76.5 4.91917 1 4.91917  
68 77 77.5 5.13771 1 5.13771  
69 78 78.5 5.36296 1 5.36296  
70 79 79.5 5.59506 1 5.59506

Growth\_Parameters

Count Yr Morph A1 A2 L-at-A1 L-at-A2 K A-at-L0 Linf CVmin CVmax natM\_amin  
natM\_max M\_young M\_old  
1 1982 1 0.5 6 28.1 60.2 0.2052 -1.76669 75.5491 0.1 0.1 0 2 0.2 0.2

Season gmorph GrowPattern Sex BirthSeas age age\_Beg age\_Mid M Len\_Beg Len\_Mid  
SD\_Beg SD\_Mid Wt\_Beg Wt\_Mid Len\_Mat Age\_Mat Mat\*Fecund Len:\_1 SelWt:\_1  
RetWt:\_1 Len:\_2 SelWt:\_2 RetWt:\_2 Len:\_3 SelWt:\_3 RetWt:\_3 Len:\_4 SelWt:\_4  
RetWt:\_4 Len:\_5 SelWt:\_5 RetWt:\_5 Len:\_6 SelWt:\_6 RetWt:\_6 Len:\_7 SelWt:\_7  
RetWt:\_7 Len:\_8 SelWt:\_8 RetWt:\_8 Len:\_9 SelWt:\_9 RetWt:\_9 Len:\_10 SelWt:\_10  
RetWt:\_10 Len:\_11 SelWt:\_11 RetWt:\_11 Len:\_12 SelWt:\_12 RetWt:\_12 Len:\_13  
SelWt:\_13 RetWt:\_13 Len:\_14 SelWt:\_14 RetWt:\_14  
1 1 1 1 1 0 0 0.5 0.2 10 28.1 1 2.81 0.006815 0.17908 1 0.38 0.0025897 28.1  
0.17908 0.17908 28.1 0.17908 0.17908 28.1 0.17908 0.17908 28.1 0.17908  
0.17908 28.1 0.17908 0.17908 28.1 0.17908 0.17908 28.1 0.17908 28.1  
0.17908 0.17908 28.1 0.17908 0.17908 28.1 0.17908 0.17908 28.1 0.17908  
0.17908 28.1 0.17908 0.17908 28.1 0.17908 0.17908 28.1 0.17908 0.17908  
1 1 1 1 1 1 1 1.5 0.2 32.7269 36.9026 3.27269 3.69026 0.298237 0.445742 1  
0.91 0.271396 36.9026 0.445742 0.445742 36.9026 0.445742 0.445742 36.9026  
0.445742 0.445742 36.9026 0.445742 0.445742 36.9026 0.445742 0.445742 36.9026  
0.445742 0.445742 36.9026 0.445742 0.445742 36.9026 0.445742 0.445742 36.9026  
0.445742 0.445742 36.9026 0.445742 0.445742 36.9026 0.445742 0.445742 36.9026  
0.445742 0.445742 36.9026 0.445742 0.445742 36.9026 0.445742 0.445742  
1 1 1 1 1 2 2 2.5 0.2 40.6711 44.0721 4.06711 4.40721 0.61717 0.807472 1 0.98  
0.604826 44.0721 0.807472 0.807472 44.0721 0.807472 0.807472 44.0721 0.807472

0.807472 44.0721 0.807472 0.807472 44.0721 0.807472 0.807472 44.0721 0.807472  
0.807472 44.0721 0.807472 0.807472 44.0721 0.807472 0.807472 44.0721 0.807472  
0.807472 44.0721 0.807472 0.807472 44.0721 0.807472 0.807472 44.0721 0.807472  
0.807472 44.0721 0.807472 0.807472 44.0721 0.807472 0.807472  
1 1 1 1 1 3 3 3.5 0.2 47.1415 49.9116 4.71415 4.99116 1.01154 1.22454 1 1  
1.01154 49.9116 1.22454 1.22454 49.9116 1.22454 1.22454 49.9116 1.22454  
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1 1 1 1 1 5 5 5.5 0.2 56.7039 58.5416 5.67039 5.85416 1.8768 2.08816 1 1  
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1 1 1 1 1 6 6 6.5 0.2 60.2 61.6967 6.02 6.16967 2.29261 2.48843 1 1 2.29261  
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1 1 1 1 1 7 7 7.5 0.2 63.0475 64.2666 6.30475 6.42666 2.67421 2.84884 1 1  
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1 1 1 1 1 8 8 8.5 0.2 65.3667 66.3596 6.53667 6.63596 3.01152 3.1618 1 1  
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1 1 1 1 1 9 9 9.5 0.2 67.2557 68.0644 6.72557 6.80644 3.29959 3.42512 1 1  
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1 1 1 1 1 10 10 10.5 0.2 68.7943 69.453 6.87943 6.9453 3.53886 3.64146 1 1  
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1 1 1 1 1 11 11 11.5 0.2 70.0474 70.5839 7.00474 7.05839 3.73371 3.81643 1 1  
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 1 1 1 1 1 12 12 12.5 0.2 71.0681 71.505 7.10681 7.1505 3.89048 3.95667 1 1  
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 1 1 1 1 1 13 13 13.5 0.2 71.8994 72.2553 7.18994 7.22553 4.0158 4.06859 1 1  
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 1 1 1 1 1 15 15 15.5 0.2 73.1279 73.364 7.31279 7.3364 4.19539 4.22897 1 1  
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MEAN\_BODY\_WT(begin)

morph year season 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15  
 1 1982 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
 3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539  
 1 1983 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
 3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539  
 1 1984 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
 3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539  
 1 1985 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
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 1 1986 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
 3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539  
 1 1987 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
 3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539  
 1 1988 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
 3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539  
 1 1989 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
 3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539  
 1 1990 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
 3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539  
 1 1991 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
 3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539  
 1 1992 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
 3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539  
 1 1993 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
 3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539  
 1 1994 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
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1 1995 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
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 1 1996 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
 3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539  
 1 1997 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
 3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539  
 1 1998 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
 3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539  
 1 1999 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
 3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539  
 1 2000 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
 3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539  
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 1 2006 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
 3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539  
 1 2007 1 0.006815 0.298237 0.61717 1.01154 1.44214 1.8768 2.29261 2.67421  
 3.01152 3.29959 3.53886 3.73371 3.89048 4.0158 4.11573 4.19539

MEAN\_SIZE\_TIMESERIES

morph year season beg/mid 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15  
 1 1982 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
 67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
 1 1982 1 1 28.1 36.9026 44.0721 49.9116 54.6677 58.5416 61.6967 64.2666  
 66.3596 68.0644 69.453 70.5839 71.505 72.2553 72.8663 73.364  
 1 1983 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
 67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
 1 1983 1 1 28.1 36.9026 44.0721 49.9116 54.6677 58.5416 61.6967 64.2666  
 66.3596 68.0644 69.453 70.5839 71.505 72.2553 72.8663 73.364  
 1 1984 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
 67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
 1 1984 1 1 28.1 36.9026 44.0721 49.9116 54.6677 58.5416 61.6967 64.2666  
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 1 1985 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
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 1 1986 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
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 1 1986 1 1 28.1 36.9026 44.0721 49.9116 54.6677 58.5416 61.6967 64.2666  
 66.3596 68.0644 69.453 70.5839 71.505 72.2553 72.8663 73.364  
 1 1987 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
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 1 1988 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
 67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
 1 1988 1 1 28.1 36.9026 44.0721 49.9116 54.6677 58.5416 61.6967 64.2666  
 66.3596 68.0644 69.453 70.5839 71.505 72.2553 72.8663 73.364



1 2003 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
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1 2003 1 1 28.1 36.9026 44.0721 49.9116 54.6677 58.5416 61.6967 64.2666  
66.3596 68.0644 69.453 70.5839 71.505 72.2553 72.8663 73.364  
1 2004 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
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1 2004 1 1 28.1 36.9026 44.0721 49.9116 54.6677 58.5416 61.6967 64.2666  
66.3596 68.0644 69.453 70.5839 71.505 72.2553 72.8663 73.364  
1 2005 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
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1 2005 1 1 28.1 36.9026 44.0721 49.9116 54.6677 58.5416 61.6967 64.2666  
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1 2006 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
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1 2006 1 1 28.1 36.9026 44.0721 49.9116 54.6677 58.5416 61.6967 64.2666  
66.3596 68.0644 69.453 70.5839 71.505 72.2553 72.8663 73.364  
1 2007 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
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1 2007 1 1 28.1 36.9026 44.0721 49.9116 54.6677 58.5416 61.6967 64.2666  
66.3596 68.0644 69.453 70.5839 71.505 72.2553 72.8663 73.364

mean\_size\_Jan\_1\_for\_gender: 1

1 1982 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
1 1983 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
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1 1984 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
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1 1985 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
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1 1986 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
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1 1987 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
1 1988 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
1 1989 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
1 1990 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
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1 1991 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
1 1992 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
1 1993 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
1 1994 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
1 1995 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
1 1996 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
1 1997 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
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1 1998 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
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1 1999 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
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 1 2000 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
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 1 2001 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
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 1 2006 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
 67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279  
 1 2007 1 0 10 32.7269 40.6711 47.1415 52.4115 56.7039 60.2 63.0475 65.3667  
 67.2557 68.7943 70.0474 71.0681 71.8994 72.5765 73.1279

AGE\_LENGTH\_KEY

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 sdwithin 1  
 sdbetween 1e-006

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AGE\_AGE\_KEY

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4 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0  
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Composition\_Database

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14 1982 A 1 1 0  
14 1982 A 1 2 0  
14 1982 A 1 3 0  
14 1982 A 1 4 0  
14 1982 A 1 5 0  
14 1982 A 1 6 0  
14 1982 A 1 7 0  
14 1982 A 1 8 0  
14 1982 A 1 9 0  
14 1982 A 1 10 0  
14 1982 A 1 11 0  
14 1982 A 1 12 0  
14 1982 A 1 13 0  
14 1982 A 1 14 0  
14 1982 A 1 15 0  
14 2006 L 1 10 1  
14 2006 L 1 11 1  
14 2006 L 1 12 1  
14 2006 L 1 13 1  
14 2006 L 1 14 1  
14 2006 L 1 15 1  
14 2006 L 1 16 1  
14 2006 L 1 17 1  
14 2006 L 1 18 1

14 2006 L 1 19 1  
14 2006 L 1 20 1  
14 2006 L 1 21 1  
14 2006 L 1 22 1  
14 2006 L 1 23 1  
14 2006 L 1 24 1  
14 2006 L 1 25 1  
14 2006 L 1 26 1  
14 2006 L 1 27 1  
14 2006 L 1 28 1  
14 2006 L 1 29 1  
14 2006 L 1 30 1  
14 2006 L 1 31 1  
14 2006 L 1 32 1  
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14 2006 L 1 34 1  
14 2006 L 1 35 1  
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14 2006 L 1 53 1  
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14 2006 L 1 61 1  
14 2006 L 1 62 1  
14 2006 L 1 63 1  
14 2006 L 1 64 1  
14 2006 L 1 65 1  
14 2006 L 1 66 1  
14 2006 L 1 67 1  
14 2006 L 1 68 1  
14 2006 L 1 69 1  
14 2006 L 1 70 1  
14 2006 L 1 71 1  
14 2006 L 1 72 1  
14 2006 L 1 73 1  
14 2006 L 1 74 1  
14 2006 L 1 75 1

14 2006 L 1 76 1  
14 2006 L 1 77 1  
14 2006 L 1 78 1  
14 2006 L 1 79 1

**SS2 ALTERNATIVE RUN (F08 SEXStructured.REP)**

Code\_version: \_\_2.00o;\_01/31/08;\_Stock\_Synthesis\_2\_by\_Richard\_Methot\_(NOAA);\_  
using\_Otter\_Research\_ADMB\_7.0.1

Time: Sat May 17 12:47:08 2008

Data\_File: maunder.DAT  
Control\_File: maunder.CTL

Convergence\_Level:  
Hessian:  
Sum\_of\_months\_on\_read\_was:\_ 12 rescaled\_to\_sum\_to: 1

LIKELIHOOD 2744.38  
indices 187.449  
discard 0  
length\_comps 0  
age\_comps 2476.08  
size-at-age 0  
mean\_body\_wt 0  
Equil\_catch 0  
catch 33.771  
Recruitment 9.09625  
Parm\_priors 0  
Parm\_devs 37.977  
penalties 0  
Forecast\_Recruitment 1.09564e-030

Fleet surv\_lambda surv\_like disc\_lambda disc\_like length\_lambda length\_like  
age\_lambda age\_like sizeage\_lambda sizeage\_like  
1 0 0 0 0 0 0 1 73.1485 0 0  
2 0 0 0 0 0 0 1 120.7 0 0  
3 0 0 0 0 0 0 1 277.383 0 0  
4 0 0 0 0 0 0 1 183.812 0 0  
5 0 0 0 0 0 0 1 66.8626 0 0  
6 0 0 0 0 0 0 1 153.008 0 0  
7 1 54.4921 0 0 0 0 1 219.146 0 0  
8 1 80.7492 0 0 0 0 1 751.994 0 0  
9 1 52.2079 0 0 0 0 1 630.03 0 0

Source Lambda Like  
mean\_body\_wt 0 0  
Equil\_catch 0 0  
Catch 1 33.771  
Recruitment 1 9.09625  
Parm\_priors 0 0  
Parm\_devs 1 37.977  
penalties 0

Variance\_adjustments\_to\_input\_values 1 2 3 4 5 6 7 8 9  
Index\_extra\_CV 0 0 0 0 0 0 0 0 0  
Discard\_extra\_CV 0 0 0 0 0 0 0 0 0  
MeanBodyWt\_extra\_CV 0 0 0 0 0 0 0 0 0  
effN\_mult\_Lencomp 1 1 1 1 1 1 1 1 1

effN\_mult\_Agecomp 1 1 1 1 1 1 1 1 1  
effN\_mult\_Len-at-age 1 1 1 1 1 1 1 1 1

PARAMETERS

Num Value Phase Min Max Init Prior PR\_type SD Active\_Cnt Prior\_Like Bound

M-G\_parmsUsing\_offset\_approach#:\_3

Gender:\_1\_Pattern:\_1

1 0.287429 3 0.05 0.8 0.2 0.2 0 0.8 1 0  
2 0 -3  
3 29.61 -2  
4 62.12 -2  
5 0.200667 -3  
6 0.001 -2  
7 0 -3

Gender:\_2\_Pattern:\_1

8 0.631743 3 -3 3 0.154151 0 0 0.8 2 0  
9 0 -3  
10 -0.0243857 -2  
11 -0.155104 -3  
12 0.0619715 -3  
13 0 -3  
14 0 -3

biology\_parms

15 2.44e-006 -3  
16 3.34694 -3  
17 28.1 -3  
18 -0.25 -3  
19 1 -3  
20 0 -3  
21 2.44e-006 -3  
22 3.34694 -3

recrdist\_by\_growthpattern:1

23 0 -3

recrdist\_by\_area:1

24 0 -3

recrdist\_by\_seas:1

25 4 -3

cohort\_growth\_dev:2

26 1 -3

MGparm\_env\_linkages

MG\_parm\_blockparms

M-G\_parm\_devs 1

1\_YR1976 0 -

MGParm\_Block\_Assignments

SR\_parms

1 11.1586 1 3 31 10.1121 0 -1 99 3 0  
2 1 -1  
3 0.6 -1  
4 0 -1  
5 -0.0396692 1 -5 5 0 0 -1 99 4 0  
6 0 -1

Recr\_Devs

1970 -0.475066 - - - - - 5  
1971 -0.14295 - - - - - 6  
1972 -0.0159156 - - - - - 7  
1973 -0.0537484 - - - - - 8

```

1974 0.514565 - - - - - 9
1975 0.291379 - - - - - 10
1976 0.289242 - - - - - 11
1977 0.138823 - - - - - 12
1978 -0.0294581 - - - - - 13
1979 -0.377302 - - - - - 14
1980 0.348669 - - - - - 15
1981 0.384042 - - - - - 16
1982 0.604651 - - - - - 17
1983 0.588443 - - - - - 18
1984 0.0216812 - - - - - 19
1985 0.315039 - - - - - 20
1986 0.301765 - - - - - 21
1987 -0.0104133 - - - - - 22
1988 -1.26072 - - - - - 23
1989 -0.325978 - - - - - 24
1990 -0.158674 - - - - - 25
1991 -0.0293285 - - - - - 26
1992 0.0707161 - - - - - 27
1993 -0.178915 - - - - - 28
1994 0.0449586 - - - - - 29
1995 0.384236 - - - - - 30
1996 0.116184 - - - - - 31
1997 0.168637 - - - - - 32
1998 0.293698 - - - - - 33
1999 0.0526087 - - - - - 34
2000 0.209601 - - - - - 35
2001 0.203928 - - - - - 36
2002 0.222126 - - - - - 37
2003 -0.127249 - - - - - 38
2004 0.187304 - - - - - 39
2005 -0.627414 - - - - - 40
2006 -0.871828 - - - - - 41
2007 -1.06734 - - - - - 42
init_F_parms
1 0.723782 1 0 2 1 1 -1 10 43 0
2 0 -1
3 0 -1
4 0 -1
5 0 -1
6 0 -1
Q_parms
sel_parms
#_size_sel:_1
1 50.6893 2 0.5 90 60 4 -1 99 44 0
2 -9 -3
3 3.19152 3 -9 9 5 2 -1 99 45 0
4 5.72156 3 -9 9 5 9 -1 99 46 0
5 -5.35014 3 -10 10 -2 5 -1 99 47 0
6 -999 -3
#_male
#_size_sel:_2
7 44.7042 2 0.5 90 60 4 -1 99 48 0
8 -9 -3
9 4.18341 3 -9 9 5 2 -1 99 49 0
10 4.55032 3 -9 9 5 9 -1 99 50 0
11 -10 -3

```

```

12 -999 -3
#_male
#_size_sel:_3
13 29.6876 2 0.5 70 60 4 -1 99 51 0
14 -9 -3
15 -4.31897 3 -9 9 5 2 -1 99 52 0
16 4.50078 3 -9 9 5 9 -1 99 53 0
17 -2.37533 3 -10 10 -2 5 -1 99 54 0
18 -15 -3
#_male
#_size_sel:_4
19 40.9342 2 0.5 90 60 4 -1 99 55 0
20 -0.4361 3 -9 3 -3 -3 -1 99 56 0
21 1.58879 3 -9 9 5 2 -1 99 57 0
22 -6.36985 3 -9 9 5 9 -1 99 58 0
23 -7.66248 3 -10 10 -2 5 -1 99 59 0
24 -15 -3
#_male
#_size_sel:_5
25 42.5643 2 0.5 90 60 4 -1 99 60 0
26 -9 -3
27 3.80939 3 -9 9 5 2 -1 99 61 0
28 4.89772 3 -9 9 5 9 -1 99 62 0
29 -4.63763 3 -10 10 -2 5 -1 99 63 0
30 -999 -3
#_male
#_size_sel:_6
31 29.9673 2 0.5 70 60 4 -1 99 64 0
32 -9 -3
33 -4.82493 3 -9 9 5 2 -1 99 65 0
34 2.84761 3 -9 9 5 9 -1 99 66 0
35 -4.70611 3 -10 10 -2 5 -1 99 67 0
36 -15 -3
#_male
#_size_sel:_7
#_male
#_size_sel:_8
#_male
#_size_sel:_9
#_male
#_age_sel:_1
37 0 -2
38 15 -2
#_male
#_age_sel:_2
39 0 -2
40 15 -2
#_male
#_age_sel:_3
41 0 -2
42 15 -2
#_male
#_age_sel:_4
43 0 -2
44 15 -2
#_male
#_age_sel:_5

```



```

45 0 -2
46 15 -2
#_male
#_age_sel:_6
47 0 -2
48 15 -2
#_male
#_age_sel:_7
49 2.41518 2 0 15 4 4 -1 99 68 0
50 -3 -3
51 0.672538 3 -9 9 2 2 -1 99 69 0
52 2 -3
53 -15 -2
54 15 -2
#_male
55 2 -5
56 0 -4
57 0 -4
58 0 -4
#_age_sel:_8
59 2.43197 2 0 15 4 4 -1 99 70 0
60 -9 -3
61 0.649506 3 -9 9 2 2 -1 99 71 0
62 3.87354 3 -9 9 2 9 -1 99 72 0
63 -15 -2
64 -999 -3
#_male
65 2 -5
66 0 -4
67 0 -4
68 0 -4
#_age_sel:_9
69 2.78635 2 0 15 4 4 -1 99 73 0
70 -9 -3
71 0.480917 3 -9 9 2 2 -1 99 74 0
72 2.97285 3 -9 9 2 9 -1 99 75 0
73 -15 -3
74 -999 -3
#_male
75 0 -5
76 0 -4
77 0 -4
78 0 -4
sel_parm_env_linkages
sel_parm_blockparms
79 47.1667 2 0.5 90 60 4 -1 99 76 0
80 3.8142 3 -9 9 5 2 -1 99 77 0
81 -10 -3
82 51.6208 2 0.5 90 60 4 -1 99 78 0
83 3.53032 3 -9 9 5 2 -1 99 79 0
84 -10 -3
85 49.4883 2 0.5 90 60 4 -1 99 80 0
86 5.11851 3 -9 9 5 2 -1 99 81 0
87 -6.37802 3 -10 10 -2 5 -1 99 82 0
88 48.8969 2 0.5 90 60 4 -1 99 83 0
89 3.43883 3 -9 9 5 2 -1 99 84 0
90 -8.08323 3 -10 10 -2 5 -1 99 85 0

```

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91 41.7491 2 0.5 90 60 4 -1 99 86 0
92 4.24017 3 -9 9 5 2 -1 99 87 0
93 -5.09092 3 -10 10 -2 5 -1 99 88 0
SEL_parm_devs
1_YR1982 -0.175973 - - - - - 89
1_YR1983 -0.34234 - - - - - 90
1_YR1984 -0.0457567 - - - - - 91
1_YR1985 -0.155218 - - - - - 92
1_YR1986 -0.102172 - - - - - 93
1_YR1987 -0.184222 - - - - - 94
1_YR1988 -0.130431 - - - - - 95
1_YR1989 -0.172459 - - - - - 96
1_YR1990 -0.202096 - - - - - 97
1_YR1991 -0.183697 - - - - - 98
1_YR1992 -0.168714 - - - - - 99
1_YR1993 -0.191016 - - - - - 100
1_YR1994 -0.192538 - - - - - 101
1_YR1995 -0.12495 - - - - - 102
1_YR1996 -0.116286 - - - - - 103
1_YR1997 0.0719709 - - - - - 104
1_YR1998 0.0832629 - - - - - 105
1_YR1999 0.0656802 - - - - - 106
1_YR2000 0.019612 - - - - - 107
1_YR2001 0.00774168 - - - - - 108
1_YR2002 -0.0621498 - - - - - 109
1_YR2003 -0.00748899 - - - - - 110
1_YR2004 -0.0260343 - - - - - 111
1_YR2005 0.140299 - - - - - 112
2_YR1982 0.0862504 - - - - - 113
2_YR1983 -0.101269 - - - - - 114
2_YR1984 0.361408 - - - - - 115
2_YR1985 0.0901511 - - - - - 116
2_YR1986 0.213155 - - - - - 117
2_YR1987 -0.0346965 - - - - - 118
2_YR1988 0.22933 - - - - - 119
2_YR1989 0.00388456 - - - - - 120
2_YR1990 -0.0697631 - - - - - 121
2_YR1991 -0.105463 - - - - - 122
2_YR1992 0.0811243 - - - - - 123
2_YR1993 -0.0648332 - - - - - 124
2_YR1994 -0.295422 - - - - - 125
2_YR1995 -0.6423 - - - - - 126
2_YR1996 -0.57857 - - - - - 127
2_YR1997 0.0290984 - - - - - 128
2_YR1998 -0.0042246 - - - - - 129
2_YR1999 -0.0580146 - - - - - 130
2_YR2000 -0.0531416 - - - - - 131
2_YR2001 0.0684086 - - - - - 132
2_YR2002 -0.2901 - - - - - 133
2_YR2003 -0.0550328 - - - - - 134
2_YR2004 -0.164041 - - - - - 135
2_YR2005 0.189142 - - - - - 136
3_YR1982 -0.0254776 - - - - - 137
3_YR1983 0.144703 - - - - - 138
3_YR1984 0.0396833 - - - - - 139
3_YR1985 0.0709323 - - - - - 140
3_YR1986 0.123579 - - - - - 141

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3_YR1987	0.189529	-	-	-	-	-	142
3_YR1988	0.221251	-	-	-	-	-	143
3_YR1989	0.146416	-	-	-	-	-	144
3_YR1990	0.119221	-	-	-	-	-	145
3_YR1991	-0.388859	-	-	-	-	-	146
3_YR1992	-0.426485	-	-	-	-	-	147
3_YR1993	-0.113714	-	-	-	-	-	148
3_YR1994	-0.438408	-	-	-	-	-	149
3_YR1995	-0.393084	-	-	-	-	-	150
3_YR1996	0.0870414	-	-	-	-	-	151
3_YR1997	0.0543888	-	-	-	-	-	152
3_YR1998	-0.0813417	-	-	-	-	-	153
3_YR1999	-0.00931533	-	-	-	-	-	154
3_YR2000	0.0590248	-	-	-	-	-	155
3_YR2001	0.0948423	-	-	-	-	-	156
3_YR2002	-0.0647606	-	-	-	-	-	157
3_YR2003	0.0250486	-	-	-	-	-	158
3_YR2004	0.00599583	-	-	-	-	-	159
3_YR2005	0.104284	-	-	-	-	-	160
4_YR1982	-0.44461	-	-	-	-	-	161
4_YR1983	-0.0224525	-	-	-	-	-	162
4_YR1984	-0.257595	-	-	-	-	-	163
4_YR1985	-0.207123	-	-	-	-	-	164
4_YR1986	0.12229	-	-	-	-	-	165
4_YR1987	-0.0910988	-	-	-	-	-	166
4_YR1988	-0.00726886	-	-	-	-	-	167
4_YR1989	0.1693	-	-	-	-	-	168
4_YR1990	0.440952	-	-	-	-	-	169
4_YR1991	0.45976	-	-	-	-	-	170
4_YR1992	0.276259	-	-	-	-	-	171
4_YR1993	-0.0709051	-	-	-	-	-	172
4_YR1994	0.100335	-	-	-	-	-	173
4_YR1995	-0.331326	-	-	-	-	-	174
4_YR1996	0.0265363	-	-	-	-	-	175
4_YR1997	0.0521734	-	-	-	-	-	176
4_YR1998	0.0460435	-	-	-	-	-	177
4_YR1999	0.0264947	-	-	-	-	-	178
4_YR2000	0.02528	-	-	-	-	-	179
4_YR2001	0.0260456	-	-	-	-	-	180
4_YR2002	0.0156502	-	-	-	-	-	181
4_YR2003	0.0162774	-	-	-	-	-	182
4_YR2004	0.0153179	-	-	-	-	-	183
4_YR2005	0.0179308	-	-	-	-	-	184
5_YR1982	0.157133	-	-	-	-	-	185
5_YR1983	0.052379	-	-	-	-	-	186
5_YR1984	0.0554412	-	-	-	-	-	187
5_YR1985	-0.0347044	-	-	-	-	-	188
5_YR1986	-0.0521167	-	-	-	-	-	189
5_YR1987	0.0286505	-	-	-	-	-	190
5_YR1988	-0.0682921	-	-	-	-	-	191
5_YR1989	0.042411	-	-	-	-	-	192
5_YR1990	0.0495177	-	-	-	-	-	193
5_YR1991	0.0777415	-	-	-	-	-	194
5_YR1992	-0.100762	-	-	-	-	-	195
5_YR1993	0.150271	-	-	-	-	-	196
5_YR1994	0.0977224	-	-	-	-	-	197
5_YR1995	0.00149963	-	-	-	-	-	198

5_YR1996	0.129065	-	-	-	-	-	199
5_YR1997	0.0302359	-	-	-	-	-	200
5_YR1998	0.354067	-	-	-	-	-	201
5_YR1999	0.0984541	-	-	-	-	-	202
5_YR2000	0.0158418	-	-	-	-	-	203
5_YR2001	0.126717	-	-	-	-	-	204
5_YR2002	0.0904988	-	-	-	-	-	205
5_YR2003	0.0423255	-	-	-	-	-	206
5_YR2004	0.0576968	-	-	-	-	-	207
5_YR2005	0.0613332	-	-	-	-	-	208
6_YR1982	0.00386277	-	-	-	-	-	209
6_YR1983	0.00691529	-	-	-	-	-	210
6_YR1984	-0.0124304	-	-	-	-	-	211
6_YR1985	0.0120812	-	-	-	-	-	212
6_YR1986	-0.0408676	-	-	-	-	-	213
6_YR1987	0.000653384	-	-	-	-	-	214
6_YR1988	0.0174465	-	-	-	-	-	215
6_YR1989	0.0357581	-	-	-	-	-	216
6_YR1990	0.0459931	-	-	-	-	-	217
6_YR1991	0.14939	-	-	-	-	-	218
6_YR1992	0.160419	-	-	-	-	-	219
6_YR1993	0.106973	-	-	-	-	-	220
6_YR1994	-0.0751243	-	-	-	-	-	221
6_YR1995	0.152135	-	-	-	-	-	222
6_YR1996	0.0835339	-	-	-	-	-	223
6_YR1997	0.070601	-	-	-	-	-	224
6_YR1998	0.0237511	-	-	-	-	-	225
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6_YR2000	-0.0344111	-	-	-	-	-	227
6_YR2001	0.031572	-	-	-	-	-	228
6_YR2002	0.0253263	-	-	-	-	-	229
6_YR2003	-0.0108433	-	-	-	-	-	230
6_YR2004	0.0277691	-	-	-	-	-	231
6_YR2005	0.0244821	-	-	-	-	-	232
7_YR1989	0.129846	-	-	-	-	-	233
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7_YR1993	-0.189779	-	-	-	-	-	237
7_YR1994	0.124997	-	-	-	-	-	238
7_YR1995	0.149152	-	-	-	-	-	239
7_YR1996	-0.0386309	-	-	-	-	-	240
7_YR1997	-0.03563	-	-	-	-	-	241
7_YR1998	-0.0223442	-	-	-	-	-	242
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7_YR2000	-0.155324	-	-	-	-	-	244
7_YR2001	-0.0412657	-	-	-	-	-	245
7_YR2002	-0.0438499	-	-	-	-	-	246
7_YR2003	0.037418	-	-	-	-	-	247
7_YR2004	-0.132894	-	-	-	-	-	248
7_YR2005	-0.117623	-	-	-	-	-	249
8_YR1989	0.253863	-	-	-	-	-	250
8_YR1990	0.0307422	-	-	-	-	-	251
8_YR1991	0.185357	-	-	-	-	-	252
8_YR1992	-0.0360023	-	-	-	-	-	253
8_YR1993	-0.25826	-	-	-	-	-	254
8_YR1994	-0.175701	-	-	-	-	-	255

8_YR1995	0.0501757	-	-	-	-	-	256
8_YR1996	0.165152	-	-	-	-	-	257
8_YR1997	0.177927	-	-	-	-	-	258
8_YR1998	0.0267986	-	-	-	-	-	259
8_YR1999	0.105897	-	-	-	-	-	260
8_YR2000	-0.278489	-	-	-	-	-	261
8_YR2001	0.0446995	-	-	-	-	-	262
8_YR2002	0.0719096	-	-	-	-	-	263
8_YR2003	0.130105	-	-	-	-	-	264
8_YR2004	0.157504	-	-	-	-	-	265
8_YR2005	-0.536142	-	-	-	-	-	266
9_YR1994	0.610094	-	-	-	-	-	267
9_YR1995	0.0340429	-	-	-	-	-	268
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9_YR1997	0.18744	-	-	-	-	-	270
9_YR1998	0.276188	-	-	-	-	-	271
9_YR1999	-0.125824	-	-	-	-	-	272
9_YR2000	0.482799	-	-	-	-	-	273
9_YR2001	-0.405332	-	-	-	-	-	274
9_YR2002	0.105848	-	-	-	-	-	275
9_YR2003	0.688768	-	-	-	-	-	276
9_YR2004	0.163014	-	-	-	-	-	277
9_YR2005	-0.330966	-	-	-	-	-	278
10_YR1994	0.170081	-	-	-	-	-	279
10_YR1995	0.209633	-	-	-	-	-	280
10_YR1996	0.109115	-	-	-	-	-	281
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10_YR1998	-0.269585	-	-	-	-	-	283
10_YR1999	-0.127151	-	-	-	-	-	284
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11_YR1985	0.0535932	-	-	-	-	-	294
11_YR1986	0.0592585	-	-	-	-	-	295
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13_YR2002	-0.334771	-	-	-	-	-	359
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1999  0.287429 0 29.61 62.12 0.200667 0.001 0 0.631743 0 -0.0243857 -0.155104
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2000  0.287429 0 29.61 62.12 0.200667 0.001 0 0.631743 0 -0.0243857 -0.155104
0.0619715 0 0 2.44e-006 3.34694 28.1 -0.25 1 0 2.44e-006 3.34694 0 0 4 1
2001  0.287429 0 29.61 62.12 0.200667 0.001 0 0.631743 0 -0.0243857 -0.155104
0.0619715 0 0 2.44e-006 3.34694 28.1 -0.25 1 0 2.44e-006 3.34694 0 0 4 1
2002  0.287429 0 29.61 62.12 0.200667 0.001 0 0.631743 0 -0.0243857 -0.155104
0.0619715 0 0 2.44e-006 3.34694 28.1 -0.25 1 0 2.44e-006 3.34694 0 0 4 1
2003  0.287429 0 29.61 62.12 0.200667 0.001 0 0.631743 0 -0.0243857 -0.155104
0.0619715 0 0 2.44e-006 3.34694 28.1 -0.25 1 0 2.44e-006 3.34694 0 0 4 1
2004  0.287429 0 29.61 62.12 0.200667 0.001 0 0.631743 0 -0.0243857 -0.155104
0.0619715 0 0 2.44e-006 3.34694 28.1 -0.25 1 0 2.44e-006 3.34694 0 0 4 1
2005  0.287429 0 29.61 62.12 0.200667 0.001 0 0.631743 0 -0.0243857 -0.155104
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0.0619715 0 0 2.44e-006 3.34694 28.1 -0.25 1 0 2.44e-006 3.34694 0 0 4 1
2007  0.287429 0 29.61 62.12 0.200667 0.001 0 0.631743 0 -0.0243857 -0.155104
0.0619715 0 0 2.44e-006 3.34694 28.1 -0.25 1 0 2.44e-006 3.34694 0 0 4 1
2008  0.287429 0 29.61 62.12 0.200667 0.001 0 0.631743 0 -0.0243857 -0.155104
0.0619715 0 0 2.44e-006 3.34694 28.1 -0.25 1 0 2.44e-006 3.34694 0 0 4 1

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SELparm(Size)\_By\_Year\_after\_adjustments

Fleet/Svy Year

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1 1984  48.4221 -9 4.58094 5.95317 -4.13517 -999
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1 1991  42.183 -9 2.87207 3.87824 -8.47298 -999
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1 2005  54.2709 -9 4.60836 6.35045 -10.1809 -999
1 2006  47.1667 -9 3.8142 5.72156 -10 -999
1 2008  50.6893 -9 3.19152 5.72156 -5.35014 -999
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2 1983  44.7042 -9 4.40837 4.55032 -10.0694 -999
2 1984  44.7042 -9 4.42189 4.55032 -9.87647 -999
2 1985  44.7042 -9 4.04072 4.55032 -10.1215 -999
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4	1994	40.9342	-0.4361	2.92433	-6.36985	-9.08311	-15
4	1995	40.9342	-0.4361	1.64381	-6.36985	-9.44956	-15
4	1996	40.9342	-0.4361	3.35385	-6.36985	-8.5459	-15
4	1997	40.9342	-0.4361	1.91633	-6.36985	-8.55451	-15
4	1998	40.9342	-0.4361	2.09417	-6.36985	-5.85181	-15
4	1999	40.9342	-0.4361	1.40095	-6.36985	-6.74758	-15
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4	2001	40.9342	-0.4361	1.05933	-6.36985	-8.55953	-15
4	2002	40.9342	-0.4361	1.76618	-6.36985	-5.7487	-15
4	2003	40.9342	-0.4361	3.16369	-6.36985	-8.25137	-15
4	2004	40.9342	-0.4361	1.87009	-6.36985	-8.43195	-15
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6	1988	29.9673	-9	-4.82493	2.84761	-3.77136	-15
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6	2003	41.7491	-9	3.58152	2.84761	-3.99071	-15
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6	2005	41.7491	-9	4.89448	2.84761	-4.56464	-15
6	2006	41.7491	-9	4.24017	2.84761	-5.09092	-15
6	2008	29.9673	-9	-4.82493	2.84761	-4.70611	-15

SELParm(Age)\_By\_Year\_after\_adjustments

Fleet/Svy Year

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3	1976	0	15

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4 1976 0 15
5 1976 0 15
6 1976 0 15
7 1976 2.41518 -3 0.672538 2 -15 15 2 0 0 0
8 1976 2.43197 -9 0.649506 3.87354 -15 -999 2 0 0 0
9 1976 2.78635 -9 0.480917 2.97285 -15 -999 0 0 0 0

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EXPLOITATION Hrate\_is\_Continuous\_F Fleet\_in\_columns;\_year\_in\_rows

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1978 1 0.395394 0.164894 0 0 0.237205 0.129656
1979 1 0.677546 0.309978 0 0 0.307296 0.162542
1980 1 0.797017 0.407128 0 0 0.487191 0.240901
1981 1 1.19887 0.256098 0 0 0.544173 0.12646
1982 1 0.424346 0.132745 0 0 0.378628 0.105932
1983 1 0.326181 0.154116 0 0 0.531414 0.127548
1984 1 0.693828 0.279954 0 0 0.45092 0.125526
1985 1 0.678355 0.261015 0 0 0.314138 0.0492914
1986 1 0.774488 0.220651 0 0 0.509996 0.246336
1987 1 0.719672 0.160732 0 0 0.344301 0.218477
1988 1 1.07617 0.31822 0 0 0.516052 0.217432
1989 1 1.0867 1.09132 0.255945 0 0.281522 0.0906378
1990 1 0.515997 1.01208 0.227523 0 0.359813 0.190948
1991 1 0.858567 0.984552 0.177143 0 0.543683 0.320465
1992 1 1.10926 1.19904 0.0821956 0 0.446145 0.220269
1993 1 0.66306 0.53421 0.0903016 0 0.608194 0.516314
1994 1 1.08322 0.675482 0.0586221 0.0508671 0.445836 0.454459
1995 1 0.648218 0.922569 0.0100902 0.0230672 0.319993 0.0571902
1996 1 0.301136 0.3308 0.0238882 0.00497588 0.346589 0.0330267
1997 1 0.296031 0.0876328 0.0108111 0.00358307 0.386893 0.0245901
1998 1 0.2913 0.0577801 0.00926402 0.00475925 0.359291 0.0387428
1999 1 0.201478 0.0738002 0.0337539 0.0125848 0.191532 0.0356813
2000 1 0.124894 0.0817649 0.0198297 0.00363208 0.29149 0.0442511
2001 1 0.102031 0.0523412 0.00643927 0.00760591 0.174506 0.0547021
2002 1 0.140309 0.0731754 0.0081662 0.00413942 0.122098 0.0344671
2003 1 0.123994 0.0630334 0.0104415 0.00198174 0.170471 0.0343858
2004 1 0.158974 0.0813588 0.00487777 0.00207774 0.150939 0.0505257
2005 1 0.169467 0.0725086 0.00457958 0.00259278 0.164474 0.0372862
2006 1 0.119758 0.0771549 0.00614518 0.00237909 0.17651 0.0384431
2007 1 0.105255 0.0547262 0.0077552 0.00349481 0.178589 0.0899916
2008 1 0.146586 0.076877 0.0490183 0.00559261 0.279572 1.78441
2009 1 0.102961 0.0539981 0.0344302 0.00392823 0.19637 1.25336

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TIME\_SERIES Bio-Smry\_age:\_1 Hrate\_is\_Continuous\_F

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pop year period season bio-all bio-smry SpawnBio recruit-0 enc_catch:_1
dead_catch:_1 ret_catch:_1 obs_cat:_1 Hrate-1 enc_catch:_2 dead_catch:_2
ret_catch:_2 obs_cat:_2 Hrate-2 enc_catch:_3 dead_catch:_3 ret_catch:_3
obs_cat:_3 Hrate-3 enc_catch:_4 dead_catch:_4 ret_catch:_4 obs_cat:_4 Hrate-4
enc_catch:_5 dead_catch:_5 ret_catch:_5 obs_cat:_5 Hrate-5 enc_catch:_6
dead_catch:_6 ret_catch:_6 obs_cat:_6 Hrate-6 SPB_vir_LH
1 1974 VIRG 1 169294 160562 125895 70165.5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1 1975 INIT 1 70507.6 62115.1 38034.2 67436.6 15955.4 15955.4 15955.4 10000
0.723782 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

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1 1976 TIME 1 73637.2 63897.1 38600.2 78264.9 11175.1 11175.1 11175.1 10769.5  
0.595971 4459.51 4459.51 4459.51 4367.04 0.120504 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 7075.59  
7075.59 7075.59 6850.4 0.182746 273.052 273.052 273.052 276.45 0.102763 38805  
1 1977 TIME 1 68514.9 60135.1 35362.7 67335 9016.7 9016.7 9016.7 8889.22  
0.452968 4594.56 4594.56 4594.56 4686.84 0.138043 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 6889.46  
6889.46 6889.46 7086.62 0.198743 285.311 285.311 285.311 285.983 0.105532  
36636.5  
1 1978 TIME 1 63147.1 56065.1 33530.6 56905.9 7489.51 7489.51 7489.51 8059.54  
0.395394 4888.77 4888.77 4888.77 4908.21 0.164894 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 7342.06  
7342.06 7342.06 7339.71 0.237205 297.802 297.802 297.802 296.197 0.129656  
34607.1  
1 1979 TIME 1 54855.8 49854.5 30479.3 40187.4 10221.8 10221.8 10221.8 10650.2  
0.677546 7032.37 7032.37 7032.37 7296.09 0.309978 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 7306.71  
7306.71 7306.71 7611.56 0.307296 302.38 302.38 302.38 307.167 0.162542  
31239.5  
1 1980 TIME 1 45530.2 35193.8 21425.8 83056.9 7359.24 7359.24 7359.24 7972.9  
0.797017 5916.5 5916.5 5916.5 6188.79 0.407128 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 7490.68  
7490.68 7490.68 7904.31 0.487191 318.945 318.945 318.945 318.981 0.240901  
22997  
1 1981 TIME 1 42952.7 32244.1 17936.1 86047.5 5730.28 5730.28 5730.28 6168.38  
1.19887 3334.65 3334.65 3334.65 3383.58 0.256098 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 8030.7  
8030.7 8030.7 8220.48 0.544173 334.222 334.222 334.222 331.74 0.12646 19563.8  
1 1982 TIME 1 48837.1 35485.2 18602.4 107287 7904.02 7904.02 7904.02 7536  
0.424346 2905.74 2905.74 2905.74 2864 0.132745 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 8637.11  
8637.11 8637.11 8267 0.378628 297.044 297.044 297.044 296 0.105932 20631.8  
1 1983 TIME 1 54094.4 40957.1 21664.9 105562 9740.43 9740.43 9740.43 10201  
0.326181 3159.47 3159.47 3159.47 3201 0.154116 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 11804.4  
11804.4 11804.4 12687 0.531414 379.477 379.477 379.477 376 0.127548 23661.8  
1 1984 TIME 1 48928.3 41474.8 22439.4 59891.7 11287.9 11287.9 11287.9 11455  
0.693828 5459.4 5459.4 5459.4 5674 0.279954 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 8124.75  
8124.75 8124.75 8512 0.45092 415.59 415.59 415.59 415 0.125526 23572.3  
1 1985 TIME 1 42851.1 32856.5 17557.3 80310.1 10762.2 10762.2 10762.2 10767  
0.678355 3868.25 3868.25 3868.25 3907 0.261015 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5556.91  
5556.91 5556.91 5665 0.314138 92.1642 92.1642 92.1642 92 0.0492914 19076.4  
1 1986 TIME 1 41503 31640.1 16551.5 79251.2 9112.71 9112.71 9112.71 9500  
0.774488 2634.47 2634.47 2634.47 2687 0.220651 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 8088.58  
8088.58 8088.58 8102 0.509996 594.386 594.386 594.386 578 0.246336 18050.6  
1 1987 TIME 1 37931.4 30713.3 15734.3 58000 10107.3 10107.3 10107.3 9945  
0.719672 2311.57 2311.57 2311.57 2326 0.160732 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5509.26  
5509.26 5509.26 5519 0.344301 528.127 528.127 528.127 522 0.218477 16831.5  
1 1988 TIME 1 29650.4 27583 14181.1 16612.2 12067.3 12067.3 12067.3 11616  
1.07617 3060.85 3060.85 3060.85 3071 0.31822 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 6534.14  
6534.14 6534.14 6634 0.516052 344.025 344.025 344.025 341 0.217432 14495.4  
1 1989 TIME 1 17405.3 12140.6 6192.17 42303.9 5649.64 5649.64 5649.64 6218  
1.0867 1787.57 1787.57 1787.57 1908 1.09132 718.894 718.894 718.894 709  
0.255945 0 0 0 0 0 1393.07 1393.07 1393.07 1435 0.281522 45.2256 45.2256  
45.2256 45 0.0906378 6992.41  
1 1990 TIME 1 18307.5 12084 5787.36 50008 2659.89 2659.89 2659.89 2962  
0.515997 962.18 962.18 962.18 1237 1.01208 1349.21 1349.21 1349.21 1214  
0.227523 0 0 0 0 0 2311.96 2311.96 2311.96 2329 0.359813 241.63 241.63 241.63  
234 0.190948 6733.33  
1 1991 TIME 1 23405.4 16322.6 7973.46 56913.3 4564.8 4564.8 4564.8 4629  
0.858567 1351.05 1351.05 1351.05 1595 0.984552 1147.33 1147.33 1147.33 1052  
0.177143 0 0 0 0 0 3617.09 3617.09 3617.09 3611 0.543683 457.311 457.311  
457.311 429 0.320465 9050.05  
1 1992 TIME 1 26815 18986.9 9121.77 62901.7 7857.21 7857.21 7857.21 6361  
1.10926 1017.97 1017.97 1017.97 1168 1.19904 721.802 721.802 721.802 690

0.0821956 0 0 0 0 0 3511.1 3511.1 3511.1 3242 0.446145 360.771 360.771  
360.771 344 0.220269 10311.6  
1 1993 TIME 1 26974.2 20875.4 9838.36 49006 5580.8 5580.8 5580.8 4401 0.66306  
1332.53 1332.53 1332.53 1313 0.53421 865.506 865.506 865.506 846 0.0903016 0  
0 0 0 0 4951.42 4951.42 4951.42 4006 0.608194 947.107 947.107 947.107 910  
0.516314 10765.4  
1 1994 TIME 1 27644.6 20015.5 9723.95 61302.2 6639.75 6639.75 6639.75 4969  
1.08322 1627.02 1627.02 1627.02 1620 0.675482 434.959 434.959 434.959 434  
0.0586221 475.364 475.364 475.364 472 0.0508671 4570.43 4570.43 4570.43 4231  
0.445836 703.221 703.221 703.221 687 0.454459 10883.6  
1 1995 TIME 1 31163.1 20452.4 9985.89 86064.1 3968.62 3968.62 3968.62 4911  
0.648218 1630.38 1630.38 1630.38 2066 0.922569 138.145 138.145 138.145 138  
0.0100902 168.186 168.186 168.186 170 0.0230672 2249.22 2249.22 2249.22 2459  
0.319993 769.961 769.961 769.961 752 0.0571902 11613.9  
1 1996 TIME 1 40070.9 31878.6 15857.5 65827.7 3915.07 3915.07 3915.07 3947  
0.301136 1692.48 1692.48 1692.48 1913 0.3308 355.796 355.796 355.796 355  
0.0238882 108.313 108.313 108.313 108 0.00497588 4333.67 4333.67 4333.67 4454  
0.346589 706.866 706.866 706.866 681 0.0330267 17102.8  
1 1997 TIME 1 47258.2 38624.7 20363.8 69372.8 3374.12 3374.12 3374.12 3313  
0.296031 673.962 673.962 673.962 681 0.0876328 240.434 240.434 240.434 239  
0.0108111 86.2928 86.2928 86.2928 86 0.00358307 6154.74 6154.74 6154.74 5382  
0.386893 570.02 570.02 570.02 556 0.0245901 21676.1  
1 1998 TIME 1 55123.8 45340.2 24546.4 78614.4 4127.67 4127.67 4127.67 3730  
0.2913 1380.56 1380.56 1380.56 1346 0.0577801 255.138 255.138 255.138 254  
0.00926402 135.447 135.447 135.447 135 0.00475925 6787.05 6787.05 6787.05  
5659 0.359291 741.571 741.571 741.571 734 0.0387428 26033.5  
1 1999 TIME 1 59112.3 51424.7 28441.7 61773 3763.53 3763.53 3763.53 3551  
0.201478 1297.52 1297.52 1297.52 1271 0.0738002 1182.3 1182.3 1182.3 1181  
0.0337539 367.901 367.901 367.901 367 0.0125848 4020.34 4020.34 4020.34 3795  
0.191532 707.321 707.321 707.321 711 0.0356813 29610.2  
1 2000 TIME 1 65313.7 56319.2 32751.1 72273.6 3657.11 3657.11 3657.11 3564  
0.124894 1560.75 1560.75 1560.75 1521 0.0817649 593.524 593.524 593.524 592  
0.0198297 134.001 134.001 134.001 134 0.00363208 7939.37 7939.37 7939.37 7470  
0.29149 939.293 939.293 939.293 952 0.0442511 34118.3  
1 2001 TIME 1 67734 58790.4 34849.3 71864.7 3699.76 3699.76 3699.76 3705  
0.102031 1290.86 1290.86 1290.86 1265 0.0523412 229.794 229.794 229.794 230  
0.00643927 237.006 237.006 237.006 238 0.00760591 5364.32 5364.32 5364.32  
5279 0.174506 1207.48 1207.48 1207.48 1274 0.0547021 36208.7  
1 2002 TIME 1 72871.3 63763.5 39099.3 73184.4 4625.61 4625.61 4625.61 4723  
0.140309 1868.09 1868.09 1868.09 1850 0.0731754 306.511 306.511 306.511 307  
0.0081662 141.793 141.793 141.793 142 0.00413942 3634.43 3634.43 3634.43 3632  
0.122098 768.918 768.918 768.918 777 0.0344671 40483.7  
1 2003 TIME 1 75635 69212.8 43582.6 51604.4 4820.88 4820.88 4820.88 4835  
0.123994 1609.67 1609.67 1609.67 1614 0.0630334 444.34 444.34 444.34 445  
0.0104415 82.9877 82.9877 82.9877 83 0.00198174 5254.48 5254.48 5254.48 5279  
0.170471 879.156 879.156 879.156 882 0.0343858 44558.8  
1 2004 TIME 1 77075.7 68279.6 44377.6 70679.9 6062.31 6062.31 6062.31 6036  
0.158974 2163.8 2163.8 2163.8 2193 0.0813588 169.967 169.967 169.967 170  
0.00487777 74.017 74.017 74.017 74 0.00207774 4793.74 4793.74 4793.74 4831  
0.150939 1044.07 1044.07 1044.07 1034 0.0505257 45714.6  
1 2005 TIME 1 72282.6 68388 44595.1 31294.5 5838.54 5838.54 5838.54 5984  
0.169467 1829 1829 1829 1841 0.0725086 152.922 152.922 152.922 153 0.00457958  
76.9755 76.9755 76.9755 77 0.00259278 4675.1 4675.1 4675.1 4724 0.164474  
988.022 988.022 988.022 999 0.0372862 45187.1  
1 2006 TIME 1 64881.1 61831 41537.1 24508.7 4323.21 4323.21 4323.21 4481  
0.119758 1761.93 1761.93 1761.93 1781 0.0771549 213.499 213.499 213.499 214

0.00614518 73.9008 73.9008 73.9008 74 0.00237909 4810.2 4810.2 4810.2 4992  
0.17651 784.395 784.395 784.395 795 0.0384431 42000.8  
1 2007 TIME 1 55966 53457.5 37275.3 20156.4 3227.7 3227.7 3227.7 3279  
0.105255 1200.54 1200.54 1200.54 1211 0.0547262 219.77 219.77 219.77 220  
0.0077552 83.9611 83.9611 83.9611 84 0.00349481 4330.67 4330.67 4330.67 4445  
0.178589 1131.91 1131.91 1131.91 1130 0.0899916 37656.6  
1 2008 TIME 1 52398 45104.3 32757 58607.2 3279 3279 3279 3279 0.146586 1211  
1211 1211 1211 0.076877 220 220 220 220 0.0490183 84 84 84 84 0.00559261 4445  
4445 4445 4445 0.279572 1130 1130 1130 1130 1.78441 33865.6  
1 2009 FORE 1 52385.1 43653 32588.8 70165.5 1686.62 1686.62 1686.62 1686.62  
0.102961 623.303 623.303 623.303 623.303 0.0539981 514.627 514.627 514.627  
514.627 0.0344302 35.6132 35.6132 35.6132 35.6132 0.00392823 2297.71 2297.71  
2297.71 2297.71 0.19637 11587.2 11587.2 11587.2 11587.2 1.25336 32588.8

SPR\_series uses\_R0= 70165.5 ###note\_Y/R\_unit\_is\_Dead\_Biomass  
Year Bio\_all Bio\_Smry SPBzero SPBfished SPBfished/R SPR Y/R GenTime Actual:  
Bio\_all Bio\_Smry Enc\_Catch Dead\_Catch Retain\_Catch SPB Recruits Tot\_Exploit  
More\_F(by\_morph): aveF-1 aveF-2 maxF-1 maxF-2  
1976 57645.9 48913.8 125895 29699.3 0.423275 0.235906 0.244023 0.380641 +  
73637.2 63897.1 22983.3 22983.3 22983.3 38600.2 78264.9 0.312115 + 0.29812  
0.522346 0.794787 0.804949  
1977 59599.1 50867 125895 31751.4 0.452522 0.252207 0.238633 0.418809 +  
68514.9 60135.1 20786 20786 20786 35362.7 67335 0.30338 + 0.246158 0.435314  
0.674094 0.697938  
1978 57726.5 48994.4 125895 30729.8 0.437962 0.244092 0.238203 0.43384 +  
63147.1 56065.1 20018.1 20018.1 20018.1 33530.6 56905.9 0.317008 + 0.234818  
0.419158 0.659411 0.69658  
1979 45272 36539.9 125895 21031 0.299735 0.167053 0.250179 0.353537 +  
54855.8 49854.5 24863.3 24863.3 24863.3 30479.3 40187.4 0.453247 + 0.388711  
0.69124 1.08718 1.14079  
1980 38767.2 30035.1 125895 16681.3 0.237742 0.132502 0.250605 0.320266 +  
45530.2 35193.8 21085.4 21085.4 21085.4 21425.8 83056.9 0.463107 + 0.488424  
0.874038 1.3873 1.47545  
1981 39166.6 30434.5 125895 16564.3 0.236075 0.131573 0.251742 0.244391 +  
42952.7 32244.1 17429.8 17429.8 17429.8 17936.1 86047.5 0.405792 + 0.634833  
1.11707 1.71882 1.76717  
1982 41473.6 32741.5 125895 20111.8 0.286634 0.159751 0.235419 0.505582 +  
48837.1 35485.2 19743.9 19743.9 19743.9 18602.4 107287 0.404281 + 0.211494  
0.410864 0.919041 0.919041  
1983 37586.6 28854.5 125895 17607.2 0.250939 0.139857 0.238694 0.486154 +  
54094.4 40957.1 25083.8 25083.8 25083.8 21664.9 105562 0.463704 + 0.257458  
0.457168 0.96694 0.973983  
1984 35566.7 26834.6 125895 14824.5 0.211278 0.117753 0.245292 0.356653 +  
48928.3 41474.8 25287.6 25287.6 25287.6 22439.4 59891.7 0.516829 + 0.453071  
0.783557 1.35485 1.35485  
1985 38046.3 29314.2 125895 16283.6 0.232074 0.129343 0.248405 0.402099 +  
42851.1 32856.5 20279.6 20279.6 20279.6 17557.3 80310.1 0.473257 + 0.374946  
0.658032 1.24314 1.24314  
1986 34967.7 26235.6 125895 14323.3 0.204136 0.113772 0.249112 0.327682 +  
41503 31640.1 20430.1 20430.1 20430.1 16551.5 79251.2 0.492257 + 0.548153  
0.861703 1.49009 1.49009  
1987 37190.7 28458.6 125895 15733.9 0.22424 0.124977 0.248963 0.343297 +  
37931.4 30713.3 18456.2 18456.2 18456.2 15734.3 58000 0.486568 + 0.510383  
0.744663 1.21137 1.21137  
1988 30417.9 21685.8 125895 11468.5 0.16345 0.0910962 0.245075 0.235096 +  
29650.4 27583 22006.3 22006.3 22006.3 14181.1 16612.2 0.742193 + 0.882904  
1.20403 1.89627 1.89627

1989 33694.6 24962.5 125895 13139.5 0.187265 0.104369 0.251344 0.196364 +  
17405.3 12140.6 9594.41 9594.41 9594.41 6192.17 42303.9 0.551234 + 0.856342  
1.52861 2.27067 2.25832  
1990 34995.4 26263.2 125895 14243.2 0.202994 0.113136 0.246918 0.301581 +  
18307.5 12084 7524.87 7524.87 7524.87 5787.36 50008 0.411027 + 0.532751  
1.06813 1.69131 1.67972  
1991 34128.4 25396.3 125895 13598.2 0.193802 0.108013 0.251626 0.394615 +  
23405.4 16322.6 11137.6 11137.6 11137.6 7973.46 56913.3 0.475855 + 0.422795  
0.919914 1.7444 1.7444  
1992 33101.4 24369.3 125895 12734.8 0.181496 0.101154 0.248914 0.368044 +  
26815 18986.9 13468.9 13468.9 13468.9 9121.77 62901.7 0.502288 + 0.468209  
1.02202 1.74979 1.85494  
1993 34890.5 26158.4 125895 14221.4 0.202684 0.112963 0.248814 0.43275 +  
26974.2 20875.4 13677.4 13677.4 13677.4 9838.36 49006 0.507054 + 0.361488  
0.778298 1.52309 1.52309  
1994 34141.5 25409.4 125895 13922.8 0.198428 0.110591 0.249828 0.443755 +  
27644.6 20015.5 14450.7 14450.7 14450.7 9723.95 61302.2 0.522733 + 0.350884  
0.746811 1.70933 1.70933  
1995 43570.4 34838.3 125895 19359.1 0.275906 0.153772 0.257921 0.379113 +  
31163.1 20452.4 8924.51 8924.51 8924.51 9985.89 86064.1 0.28638 + 0.355471  
0.820413 1.39387 1.40571  
1996 51017.9 42285.8 125895 24802.9 0.353492 0.197013 0.252104 0.401287 +  
40070.9 31878.6 11112.2 11112.2 11112.2 15857.5 65827.7 0.277314 + 0.289924  
0.600855 0.96132 0.959614  
1997 61913.5 53181.4 125895 32119.1 0.457761 0.255127 0.243968 0.399882 +  
47258.2 38624.7 11099.6 11099.6 11099.6 20363.8 69372.8 0.234871 + 0.269138  
0.495526 0.777771 0.774145  
1998 65547.5 56815.4 125895 35150.7 0.500969 0.279208 0.237615 0.430262 +  
55123.8 45340.2 13427.4 13427.4 13427.4 24546.4 78614.4 0.243587 + 0.204969  
0.436777 0.71594 0.71264  
1999 77636 68903.9 125895 45286.4 0.645423 0.359717 0.217367 0.465932 +  
59112.3 51424.7 11338.9 11338.9 11338.9 28441.7 61773 0.19182 + 0.154717  
0.311123 0.50954 0.507245  
2000 75104.8 66372.7 125895 43460.9 0.619405 0.345216 0.21985 0.474538 +  
65313.7 56319.2 14824.1 14824.1 14824.1 32751.1 72273.6 0.226967 + 0.154036  
0.310761 0.514723 0.514925  
2001 85513 76780.9 125895 53108.4 0.756902 0.421848 0.19537 0.504064 +  
67734 58790.4 12029.2 12029.2 12029.2 34849.3 71864.7 0.177595 + 0.115959  
0.218208 0.338539 0.342528  
2002 93246 84513.9 125895 59958 0.854522 0.476255 0.179493 0.526797 +  
72871.3 63763.5 11345.3 11345.3 11345.3 39099.3 73184.4 0.15569 + 0.0838613  
0.18618 0.322933 0.332763  
2003 87667 78934.9 125895 54527.6 0.777129 0.433121 0.193204 0.504245 +  
75635 69212.8 13091.5 13091.5 13091.5 43582.6 51604.4 0.173088 + 0.10842  
0.221455 0.362297 0.364519  
2004 84715.7 75983.6 125895 52055.9 0.741901 0.413488 0.199336 0.501159 +  
77075.7 68279.6 14307.9 14307.9 14307.9 44377.6 70679.9 0.185634 + 0.113706  
0.236167 0.385848 0.390276  
2005 82653 73920.9 125895 49400.5 0.704057 0.392396 0.208511 0.461895 +  
72282.6 68388 13560.6 13560.6 13560.6 44595.1 31294.5 0.187605 + 0.170831  
0.273112 0.39839 0.398926  
2006 87344.1 78612 125895 54281.9 0.773627 0.43117 0.193232 0.504339 +  
64881.1 61831 11967.1 11967.1 11967.1 41537.1 24508.7 0.184447 + 0.106859  
0.224993 0.374696 0.374267  
2007 85594 76861.9 125895 53561.8 0.763363 0.425449 0.19134 0.511678 +  
55966 53457.5 10194.6 10194.6 10194.6 37275.3 20156.4 0.182156 + 0.102903  
0.213252 0.343648 0.348872



2008 26736.1 18004 125895 10039.8 0.143088 0.079748 0.232392 0.477942 +  
 52398 45104.3 10369 10369 10369 32757 58607.2 0.197889 + 0.327395 0.587846  
 1.59044 1.94559  
 2009 33726.1 24994 125895 15154.4 0.215981 0.120374 0.231781 0.506898 +  
 52385.1 43653 16745 16745 16745 32588.8 70165.5 0.319653 + 0.229961 0.412901  
 1.11712 1.36657

SPAWN\_RECRUIT Function: 3 - - - - -

11.1586 Ln(R0) 70165.5

1 steep

0.6 stddev\_recr

0 env\_link\_

-0.0396692 init-eq 67436.6

1970 2007 recdev:start\_end 1957 first\_year\_with\_full\_bias\_adjustment

year spawn\_bio exp-recr with-env bias-adj pred-recr dev

S/Rcurve 125895 70165.5

Virg 125895 70165.5 70165.5 58607.2 70165.5

Init 38034.2 67436.6 67436.6 56327.8 67436.6

1976 38600.2 70165.5 70165.5 58607.2 78264.9 0.289242

1977 35362.7 70165.5 70165.5 58607.2 67335 0.138823

1978 33530.6 70165.5 70165.5 58607.2 56905.9 -0.0294581

1979 30479.3 70165.5 70165.5 58607.2 40187.4 -0.377302

1980 21425.8 70165.5 70165.5 58607.2 83056.9 0.348669

1981 17936.1 70165.5 70165.5 58607.2 86047.5 0.384042

1982 18602.4 70165.5 70165.5 58607.2 107287 0.604651

1983 21664.9 70165.5 70165.5 58607.2 105562 0.588443

1984 22439.4 70165.5 70165.5 58607.2 59891.7 0.0216812

1985 17557.3 70165.5 70165.5 58607.2 80310.1 0.315039

1986 16551.5 70165.5 70165.5 58607.2 79251.2 0.301765

1987 15734.3 70165.5 70165.5 58607.2 58000 -0.0104133

1988 14181.1 70165.5 70165.5 58607.2 16612.2 -1.26072

1989 6192.17 70165.5 70165.5 58607.2 42303.9 -0.325978

1990 5787.36 70165.5 70165.5 58607.2 50008 -0.158674

1991 7973.46 70165.5 70165.5 58607.2 56913.3 -0.0293285

1992 9121.77 70165.5 70165.5 58607.2 62901.7 0.0707161

1993 9838.36 70165.5 70165.5 58607.2 49006 -0.178915

1994 9723.95 70165.5 70165.5 58607.2 61302.2 0.0449586

1995 9985.89 70165.5 70165.5 58607.2 86064.1 0.384236

1996 15857.5 70165.5 70165.5 58607.2 65827.7 0.116184

1997 20363.8 70165.5 70165.5 58607.2 69372.8 0.168637

1998 24546.4 70165.5 70165.5 58607.2 78614.4 0.293698

1999 28441.7 70165.5 70165.5 58607.2 61773 0.0526087

2000 32751.1 70165.5 70165.5 58607.2 72273.6 0.209601

2001 34849.3 70165.5 70165.5 58607.2 71864.7 0.203928

2002 39099.3 70165.5 70165.5 58607.2 73184.4 0.222126

2003 43582.6 70165.5 70165.5 58607.2 51604.4 -0.127249

2004 44377.6 70165.5 70165.5 58607.2 70679.9 0.187304

2005 44595.1 70165.5 70165.5 58607.2 31294.5 -0.627414

2006 41537.1 70165.5 70165.5 58607.2 24508.7 -0.871828

2007 37275.3 70165.5 70165.5 58607.2 20156.4 -1.06734

2008 32757 70165.5 70165.5 58607.2 58607.2 8.88178e-016 forecast

2009 32588.8 70165.5 70165.5 70165.5 70165.5 0 forecast

N\_est r.m.s.e.

32 0.430711

INDEX\_2

index	year	vuln_bio	obs	exp	eff_Q	SE	Dev	Like	Like+log(s)
7	1992	23299.4	12.2947	7.51303	0.000322456	0.156307	0.492529	4.96451	3.10858
7	1993	25740.1	13.6037	8.30005	0.000322456	0.152101	0.49408	5.27595	3.39274
7	1994	25469.9	12.0506	8.21292	0.000322456	0.178228	0.383406	2.31386	0.589164
7	1995	24794.2	10.9296	7.99503	0.000322456	0.119799	0.312655	3.4056	1.28366
7	1996	39595.8	31.2461	12.7679	0.000322456	0.241612	0.89496	6.86025	5.43983
7	1997	49799.5	10.2832	16.0581	0.000322456	0.239956	-0.445705	1.72505	0.29775
7	1998	55003.3	7.75628	17.7361	0.000322456	0.206629	-0.827101	8.01134	6.43451
7	1999	60239.4	11.0546	19.4246	0.000322456	0.133137	-0.563692	8.96307	6.94669
7	2000	64960.6	15.7587	20.947	0.000322456	0.129614	-0.284601	2.41067	0.367475
7	2001	63779.7	18.5894	20.5661	0.000322456	0.113516	-0.101055	0.396249	-
1.77956									
7	2002	67202.9	22.6824	21.67	0.000322456	0.155914	0.0456615	0.0428844	-
1.81557									
7	2003	71027.8	35.6193	22.9033	0.000322456	0.187142	0.441605	2.78417	1.10828
7	2004	68454.9	17.7707	22.0737	0.000322456	0.138544	-0.216836	1.22478	-
0.751791									
7	2005	64772.2	12.8914	20.8862	0.000322456	0.14648	-0.482528	5.42573	3.50486
7	2006	59713.4	21.0442	19.2549	0.000322456	0.138773	0.0888576	0.204998	-
1.76992									
7	2007	46030.6	16.8326	14.8428	0.000322456	0.127993	0.125801	0.483017	-
1.57276									
8	1976	72426.5	2.83438	2.65484	3.66556e-005	0.334882	0.0654389	0.0190923	-
1.07488									
8	1977	65160.7	2.83863	2.38851	3.66556e-005	0.158535	0.172653	0.593016	-
1.24876									
8	1978	59711.4	2.49883	2.18876	3.66556e-005	0.191203	0.132487	0.240065	-
1.41435									
8	1979	51674.3	0.398393	1.89415	3.66556e-005	0.228214	-1.55909	23.336	21.8586
8	1980	36481.2	1.29687	1.33724	3.66556e-005	0.15492	-0.0306545	0.0195769	-
1.84527									
8	1981	32917.8	1.49903	1.20662	3.66556e-005	0.158012	0.216994	0.942939	-
0.902146									
8	1982	41488.1	2.26475	1.52077	3.66556e-005	0.196946	0.398245	2.04445	
0.419627									
8	1983	46611.3	0.948461	1.70857	3.66556e-005	0.151083	-0.58857	7.58813	5.6982
8	1984	46565.6	0.659183	1.70689	3.66556e-005	0.292897	-0.951429	5.27586	
4.04792									
8	1985	39803.8	2.3779	1.45903	3.66556e-005	0.221934	0.488443	2.42187	0.916494
8	1986	35440.4	2.14136	1.29909	3.66556e-005	0.158406	0.499776	4.97712	3.13453
8	1987	35838.2	0.926661	1.31367	3.66556e-005	0.151085	-0.348993	2.66784	
0.77793									
8	1988	33361.1	1.50145	1.22287	3.66556e-005	0.228852	0.205229	0.402103	-
1.07258									
8	1989	15299.4	0.319292	0.560809	3.66556e-005	0.1976	-0.563274	4.0629	2.44139
8	1990	13276	0.714636	0.48664	3.66556e-005	0.21618	0.384248	1.57965	0.0480097
8	1991	19421.2	1.07963	0.711897	3.66556e-005	0.170555	0.416441	2.9809	1.2122
8	1992	22669.4	1.20256	0.830961	3.66556e-005	0.177385	0.369625	2.171	0.441565
8	1993	25053	1.27405	0.918335	3.66556e-005	0.175172	0.327394	1.74655	
0.00456337									
8	1994	24891.4	0.929802	0.912409	3.66556e-005	0.146912	0.018883	0.0082603	-
1.90966									
8	1995	24137.1	1.0873	0.884762	3.66556e-005	0.214494	0.206134	0.461784	-
1.07769									
8	1996	38618	1.75558	1.41557	3.66556e-005	0.255302	0.215268	0.355483	-1.00983
8	1997	48907.4	1.06321	1.79273	3.66556e-005	0.153722	-0.522448	5.77543	
3.90282									

8 1998 54099.5 1.18648 1.98305 3.66556e-005 0.205136 -0.513647 3.13484  
 1.55076  
 8 1999 59179.6 1.59826 2.16927 3.66556e-005 0.215129 -0.305473 1.00813 -  
 0.528384  
 8 2000 63905.9 2.1379 2.34251 3.66556e-005 0.148842 -0.0913998 0.188543 -  
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 8 2001 62551.2 2.69048 2.29285 3.66556e-005 0.131647 0.159922 0.737845 -  
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 8 2002 65735.5 2.47207 2.40958 3.66556e-005 0.164547 0.0256041 0.0121063 -  
 1.79245  
 8 2003 69268.5 2.91102 2.53908 3.66556e-005 0.105669 0.136701 0.836788 -  
 1.41066  
 8 2004 66653 3.02581 2.44321 3.66556e-005 0.220811 0.213866 0.469043 -1.0414  
 8 2005 62652.3 1.80914 2.29656 3.66556e-005 0.200644 -0.238562 0.706837 -  
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 8 2006 57793.9 1.76325 2.11847 3.66556e-005 0.183625 -0.183537 0.499519 -  
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 8 2007 44143.4 3.24656 1.6181 3.66556e-005 0.26374 0.696341 3.48547 2.15268  
 9 1977 49840.5 1.13957 1.73069 3.47246e-005 0.181749 -0.417868 2.64304  
 0.937915  
 9 1978 45554.4 2.17069 1.58186 3.47246e-005 0.289673 0.316447 0.596698 -  
 0.642304  
 9 1979 39720.5 0.314982 1.37928 3.47246e-005 0.273479 -1.4768 14.5802 13.2837  
 9 1980 27728 1.16618 0.962844 3.47246e-005 0.341586 0.191597 0.157307 -  
 0.916849  
 9 1981 20932.2 0.935167 0.726861 3.47246e-005 0.285575 0.25199 0.389311 -  
 0.863939  
 9 1982 26493.7 0.909398 0.919983 3.47246e-005 0.303798 -0.0115726 0.000725535  
 -1.19067  
 9 1983 30124.1 1.57254 1.04605 3.47246e-005 0.378808 0.407674 0.579106 -  
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 9 1984 30222.4 0.89911 1.04946 3.47246e-005 0.384713 -0.154626 0.0807719 -  
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 9 1985 27607.3 0.992015 0.958652 3.47246e-005 0.54885 0.03421 0.00194254 -  
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 9 1986 23023.3 1.24369 0.799474 3.47246e-005 0.260118 0.441884 1.44293  
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 9 1987 22753 0.679787 0.790086 3.47246e-005 0.351407 -0.150363 0.091544 -  
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 9 1988 22436.3 0.257265 0.77909 3.47246e-005 0.332309 -1.10802 5.55879 4.4571  
 9 1989 11125.3 0.109191 0.386321 3.47246e-005 0.389323 -1.26357 5.26682  
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 9 1990 7632.01 0.201527 0.265018 3.47246e-005 0.49991 -0.273875 0.150069 -  
 0.543258  
 9 1991 11689.9 0.266991 0.405928 3.47246e-005 0.263887 -0.41896 1.26032 -  
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 9 1992 13679.5 0.50745 0.475015 3.47246e-005 0.340459 0.066052 0.0188197 -  
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 9 1993 15166.4 0.854496 0.526646 3.47246e-005 0.327251 0.483984 1.09363 -  
 0.0233992  
 9 1994 16109.8 0.112407 0.559404 3.47246e-005 0.535758 -1.60475 4.48586  
 3.86178  
 9 1995 14764 0.595507 0.512674 3.47246e-005 0.276534 0.149773 0.14667 -  
 1.13875  
 9 1996 24111 1.12882 0.837243 3.47246e-005 0.273761 0.298814 0.595701 -  
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 9 1997 34307 0.709222 1.1913 3.47246e-005 0.344281 -0.518628 1.13463 0.068336

9 1998 40160.3 1.32099 1.39455 3.47246e-005 0.258547 -0.0541883 0.0219635 -  
1.33071  
9 1999 43747.2 2.32312 1.5191 3.47246e-005 0.361277 0.424791 0.691256 -  
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9 2000 49401.9 2.41667 1.71546 3.47246e-005 0.193274 0.34271 1.57209 -0.07156  
9 2001 48323.1 1.90251 1.678 3.47246e-005 0.22368 0.125572 0.157581 -1.33996  
9 2002 50610.6 1.5635 1.75743 3.47246e-005 0.329862 -0.116926 0.0628244 -  
1.04626  
9 2003 53627.3 1.32269 1.86218 3.47246e-005 0.406018 -0.342082 0.354928 -  
0.54643  
9 2004 53304.3 2.00321 1.85097 3.47246e-005 0.248761 0.0790425 0.0504808 -  
1.34078  
9 2005 48916.8 2.99743 1.69861 3.47246e-005 0.264449 0.567943 2.30619  
0.976084  
9 2006 46940.5 1.56456 1.62999 3.47246e-005 0.290573 -0.0409672 0.00993877 -  
1.22596  
9 2007 37594.1 2.09713 1.30544 3.47246e-005 0.197404 0.47403 2.88317 1.26066  
9 2008 27605.4 2.21 0.958586 3.47246e-005 0.302095 0.835289 3.82257 2.62556

INDEX\_1

Index Do\_Power Power Do\_Env\_var Env\_Link Do\_ExtraVar Qtype Q Num=0/Bio=1  
Err\_type N Npos r.m.s.e. mean\_input\_SE mean\_(Input+extra)\_SE pen\_mean\_Qdev  
rmse\_Qdev  
1 0 1.0 0 0.00 0.0 0 -- 1 0 0 0 0 0 0 0 0  
2 0 1.0 0 0.00 0.0 0 -- 1 0 0 0 0 0 0 0 0  
3 0 1.0 0 0.00 0.0 0 -- 1 0 0 0 0 0 0 0 0  
4 0 1.0 0 0.00 0.0 0 -- 1 0 0 0 0 0 0 0 0  
5 0 1.0 0 0.00 0.0 0 -- 1 0 0 0 0 0 0 0 0  
6 0 1.0 0 0.00 0.0 0 -- 1 0 0 0 0 0 0 0 0  
7 0 1.0 0 0.00 0.0 0 0.000322456 0 0 16 16 0.45585 0.160359 0.160359 0 0  
8 0 1.0 0 0.00 0.0 0 3.66556e-005 0 0 32 32 0.463306 0.19294 0.19294 0 0  
9 0 1.0 0 0.00 0.0 0 3.47246e-005 0 0 32 32 0.58456 0.320599 0.320599 0 0  
rmse\_Qdev\_not\_in\_logL  
pen\_mean\_Qdev\_not\_in\_logL\_in\_randwalk\_approach

INDEX\_3

Index Q\_parm\_assignments  
1 0 -- 0 -- 0 0  
2 0 -- 0 -- 0 0  
3 0 -- 0 -- 0 0  
4 0 -- 0 -- 0 0  
5 0 -- 0 -- 0 0  
6 0 -- 0 -- 0 0  
7 0 -- 0 -- 0 0  
8 0 -- 0 -- 0 0  
9 0 -- 0 -- 0 0

DISCARD log(L)\_based\_on\_T-distribution\_with\_DF=\_30  
as\_fraction  
index year seas obs exp cv Dev Like Like+log(s)

MEAN\_BODY\_WT log(L)\_based\_on\_T-distribution\_with\_DF=\_30  
year seas index Mkt obs exp cv Dev Like Like+log(s)  
1982 1 1 0 0.504 0.584366 0.1 -0.0803661 1.26098 1.26098  
1983 1 1 0 0.521 0.510163 0.1 0.010837 0.0223376 0.0223376  
1984 1 1 0 0.518 0.66308 0.1 -0.14508 3.60042 3.60042

```

1985 1 1 0 0.575 0.693915 0.1 -0.118915 2.06578 2.06578
1986 1 1 0 0.613 0.700616 0.1 -0.0876163 1.02112 1.02112
1987 1 1 0 0.581 0.652126 0.1 -0.0711255 0.755581 0.755581
1988 1 1 0 0.588 0.660922 0.1 -0.0729225 0.774955 0.774955
1989 1 1 0 0.668 0.712032 0.1 -0.044032 0.222879 0.222879
1990 1 1 0 0.54 0.562826 0.1 -0.0228264 0.0920465 0.0920465
1991 1 1 0 0.537 0.590777 0.1 -0.0537771 0.509679 0.509679
1992 1 1 0 0.595 0.554206 0.1 0.040794 0.240984 0.240984
1993 1 1 0 0.571 0.575056 0.1 -0.00405563 0.00260626 0.00260626
1994 1 1 0 0.605 0.636079 0.1 -0.0310787 0.135745 0.135745
1995 1 1 0 0.675 0.636646 0.1 0.038354 0.16592 0.16592
1996 1 1 0 0.621 0.701931 0.1 -0.0809313 0.853586 0.853586
1997 1 1 0 0.697 0.8833 0.1 -0.1863 3.31099 3.31099
1998 1 1 0 0.759 1.03133 0.1 -0.272325 5.53432 5.53432
1999 1 1 0 0.755 1.08782 0.1 -0.332816 7.74066 7.74066
2000 1 1 0 0.85 1.01957 0.1 -0.169574 1.93089 1.93089
2001 1 1 0 0.903 0.975038 0.1 -0.0720384 0.325384 0.325384
2002 1 1 0 0.898 0.963027 0.1 -0.065027 0.268582 0.268582
2003 1 1 0 0.999 1.05069 0.1 -0.0516921 0.13772 0.13772
2004 1 1 0 0.983 1.07207 0.1 -0.0890714 0.418508 0.418508
2005 1 1 0 0.949 1.36764 0.1 -0.41864 7.74957 7.74957
2006 1 1 0 0.947 1.08413 0.1 -0.137135 1.04725 1.04725

```

FIT\_LEN\_COMPS

Index Year Seas Gender Mkt Nsamp effN Like

```

index N Npos mean_effN mean(inputN) HarMean(effN) Mean(effN/inputN)
MeaneffN/MeainputN
1 0 0 0 0 0 0 -1.#IND
2 0 0 0 0 0 0 -1.#IND
3 0 0 0 0 0 0 -1.#IND
4 0 0 0 0 0 0 -1.#IND
5 0 0 0 0 0 0 -1.#IND
6 0 0 0 0 0 0 -1.#IND
7 0 0 0 0 0 0 -1.#IND
8 0 0 0 0 0 0 -1.#IND
9 0 0 0 0 0 0 -1.#IND

```

FIT\_AGE\_COMPS

Index Year Seas Gender Mkt Ageerr Lbin\_lo Lbin\_hi Nsamp effN Like

```

1 1982 1 0 0 1 1 55 200 678.832 3.73748
1 1983 1 0 0 1 1 55 200 142.913 2.97809
1 1984 1 0 0 1 1 55 200 513.809 1.7752
1 1985 1 0 0 1 1 55 200 286.356 2.18121
1 1986 1 0 0 1 1 55 200 104.001 3.92782
1 1987 1 0 0 1 1 55 200 4753.23 0.697715
1 1988 1 0 0 1 1 55 200 440.994 1.74849
1 1989 1 0 0 1 1 55 200 1522.02 0.988077
1 1990 1 0 0 1 1 55 200 42.705 7.42745
1 1991 1 0 0 1 1 55 200 127.636 2.24531
1 1992 1 0 0 1 1 55 200 119.563 2.35414
1 1993 1 0 0 1 1 55 200 484.346 4.41191
1 1994 1 0 0 1 1 55 200 35.1191 5.53968
1 1995 1 0 0 1 1 55 200 132.572 1.80091
1 1996 1 0 0 1 1 55 200 41.408 10.594
1 1997 1 0 0 1 1 55 200 64.4139 5.97107
1 1998 1 0 0 1 1 55 200 1676.86 0.959758

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1	1999	1	0	0	1	1	55	200	389.541	2.03139
1	2000	1	0	0	1	1	55	200	384.548	2.15074
1	2001	1	0	0	1	1	55	200	510.157	2.00466
1	2002	1	0	0	1	1	55	200	250.604	2.39995
1	2003	1	0	0	1	1	55	200	12434.5	0.135202
1	2004	1	0	0	1	1	55	200	2333.25	0.41005
1	2005	1	0	0	1	1	55	200	402.36	1.70737
1	2006	1	0	0	1	1	55	200	948.285	1.44493
1	2007	1	0	0	1	1	55	200	271.367	1.52587
2	1982	1	0	0	1	1	55	200	28.3912	7.41697
2	1983	1	0	0	1	1	55	200	68.3539	6.5871
2	1984	1	0	0	1	1	55	200	35.6905	4.91642
2	1985	1	0	0	1	1	55	200	306.175	1.70836
2	1986	1	0	0	1	1	55	200	54.315	3.99331
2	1987	1	0	0	1	1	55	200	829.349	1.28283
2	1988	1	0	0	1	1	55	200	88.1069	9.1314
2	1989	1	0	0	1	1	55	200	415.652	2.01452
2	1990	1	0	0	1	1	55	200	33.2601	6.86815
2	1991	1	0	0	1	1	55	200	111.386	2.92482
2	1992	1	0	0	1	1	55	200	54.3118	4.77538
2	1993	1	0	0	1	1	55	200	601.718	1.12501
2	1994	1	0	0	1	1	55	200	2248.77	0.465538
2	1995	1	0	0	1	1	55	200	117.225	3.29432
2	1996	1	0	0	1	1	55	200	761.748	3.37674
2	1997	1	0	0	1	1	55	200	352.515	2.85688
2	1998	1	0	0	1	1	55	200	32.4378	12.9899
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2	2003	1	0	0	1	1	55	200	107.771	4.26627
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2	2006	1	0	0	1	1	55	200	265.096	3.032
2	2007	1	0	0	1	1	55	200	150.512	3.59969
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6	2001	1	0	0	1	1	55	200	165.636	2.37047

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6	2004	1	0	0	1	1	55	200	42.2709	6.99858
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index N Npos mean\_effN mean(inputN) HarMean(effN) Mean(effN/inputN)  
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2 1992 1 1992-2 7.97264e-006 7.97276e-006 7.97294e-006 7.97334e-006 7.97507e-006 7.98436e-006 8.03321e-006 8.27267e-006 9.35445e-006 1.38479e-005 3.09959e-005 9.10881e-005 0.000284364 0.000854576 0.00239658 0.0062155 0.0148673 0.0327714 0.0665486 0.124486 0.214496 0.340434 0.497688 0.670179 0.831251 0.949692 0.999463 0.999981 0.991927 0.963505 0.916332 0.85325 0.7779 0.694378 0.606865 0.519294 0.435069 0.356885 0.28663 0.225393 0.173533 0.130813 0.0965475 0.0697681 0.0493625 0.0341949 0.0231927 0.0154015 0.0100139 0.00637476 0.0039733 0.00242472 0.00144876 0.000847536 0.000485449

2 1992 2 1992-2 7.97264e-006 7.97276e-006 7.97294e-006 7.97334e-006 7.97507e-006 7.98436e-006 8.03321e-006 8.27267e-006 9.35445e-006 1.38479e-005 3.09959e-005 9.10881e-005 0.000284364 0.000854576 0.00239658 0.0062155 0.0148673 0.0327714 0.0665486 0.124486 0.214496 0.340434 0.497688 0.670179 0.831251 0.949692 0.999463 0.999981 0.991927 0.963505 0.916332 0.85325 0.7779 0.694378 0.606865 0.519294 0.435069 0.356885 0.28663 0.225393 0.173533 0.130813 0.0965475 0.0697681 0.0493625 0.0341949 0.0231927 0.0154015 0.0100139 0.00637476 0.0039733 0.00242472 0.00144876 0.000847536 0.000485449

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2 1999 2 1999-2 0.000109214 0.000110947 0.000115557 0.000127313 0.000156048  
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2 2000 2 2000-2 6.36737e-005 6.36934e-005 6.37685e-005 6.40407e-005 6.49728e-  
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2 2001 1 2001-2 3.29454e-005 3.92431e-005 5.42902e-005 8.89052e-005  
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2 2003 1 2003-2 5.05717e-005 5.06646e-005 5.09787e-005 5.1987e-005 5.50613e-005 6.39598e-005 8.84056e-005 0.000152132 0.000309728 0.000679356 0.00150127 0.00323331 0.00669072 0.0132243 0.0249046 0.0446408 0.0761251 0.123473 0.190468 0.279417 0.38981 0.517154 0.652449 0.782768 0.893055 0.968905 0.999671 0.999982 0.991927 0.963505 0.916332 0.85325 0.7779 0.694378 0.606865 0.519294 0.435069 0.356885 0.28663 0.225393 0.173533 0.130813 0.0965475 0.0697681 0.0493625 0.0341949 0.0231927 0.0154015 0.0100139 0.00637476 0.0039733 0.00242472 0.00144876 0.000847536 0.000485449

2 2003 2 2003-2 5.05717e-005 5.06646e-005 5.09787e-005 5.1987e-005 5.50613e-005 6.39598e-005 8.84056e-005 0.000152132 0.000309728 0.000679356 0.00150127 0.00323331 0.00669072 0.0132243 0.0249046 0.0446408 0.0761251 0.123473 0.190468 0.279417 0.38981 0.517154 0.652449 0.782768 0.893055 0.968905 0.999671 0.999982 0.991927 0.963505 0.916332 0.85325 0.7779 0.694378 0.606865 0.519294 0.435069 0.356885 0.28663 0.225393 0.173533 0.130813 0.0965475 0.0697681 0.0493625 0.0341949 0.0231927 0.0154015 0.0100139 0.00637476 0.0039733 0.00242472 0.00144876 0.000847536 0.000485449

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2 2006 2 2006-2 4.54022e-005 4.54096e-005 4.54399e-005 4.55585e-005 4.59954e-005 4.75117e-005 5.2467e-005 6.77079e-005 0.000111815 0.00023188 0.000539208 0.00127862 0.00294994 0.00649702 0.0135603 0.0267456 0.0497926 0.0874586 0.144903 0.226435 0.333724 0.46387 0.608087 0.751785 0.876553 0.963871 0.999617 0.999982 0.991927 0.963505 0.916332 0.85325 0.7779 0.694378 0.606865 0.519294 0.435069 0.356885 0.28663 0.225393 0.173533 0.130813 0.0965475 0.0697681 0.0493625 0.0341949 0.0231927 0.0154015 0.0100139 0.00637476 0.0039733 0.00242472 0.00144876 0.000847536 0.000485449

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2 1992 2 1992-2 7.97264e-006 7.97276e-006 7.97294e-006 7.97334e-006 7.97507e-006 7.98436e-006 8.03321e-006 8.27267e-006 9.35445e-006 1.38479e-005 3.09959e-005 9.10881e-005 0.000284364 0.000854576 0.00239658 0.0062155 0.0148673 0.0327714 0.0665486 0.124486 0.214496 0.340434 0.497688 0.670179 0.831251 0.949692 0.999463 0.999981 0.991927 0.963505 0.916332 0.85325 0.7779 0.694378 0.606865 0.519294 0.435069 0.356885 0.28663 0.225393 0.173533 0.130813 0.0965475 0.0697681 0.0493625 0.0341949 0.0231927 0.0154015 0.0100139 0.00637476 0.0039733 0.00242472 0.00144876 0.000847536 0.000485449  
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6 2005 1 2005-6 0.0103063 0.0526199 0.102399 0.159825 0.224745 0.296603  
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6 2005 2 2005-6 0.0103063 0.0526199 0.102399 0.159825 0.224745 0.296603  
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6 2006 1 2006-6 0.00611475 0.0191273 0.0380166 0.0645372 0.100526 0.147688  
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6 2006 2 2006-6 0.00611475 0.0191273 0.0380166 0.0645372 0.100526 0.147688  
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6 2009 1 2009-6 0.00611475 0.0191273 0.0380166 0.0645372 0.100526 0.147688  
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6 2009 2 2009-6 0.00611475 0.0191273 0.0380166 0.0645372 0.100526 0.147688  
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3.09788e-007 3.09709e-007 3.09637e-007 3.0957e-007 3.09508e-007 3.0945e-007  
3.09396e-007 3.09346e-007



DEADFISH equals\_sel\*(retain+(1-retain)\*discmort)

fleet	year	gender	label	25.5	26.5	27.5	28.5	29.5	30.5	31.5	32.5	33.5	34.5	35.5	36.5	37.5	38.5	39.5	40.5	41.5	42.5	43.5	44.5	45.5	46.5	47.5	48.5	49.5	50.5	51.5	52.5	53.5	54.5	55.5	56.5	57.5	58.5	59.5	60.5	61.5	62.5	63.5	64.5	65.5	66.5	67.5	68.5	69.5	70.5	71.5	72.5	73.5	74.5	75.5	76.5	77.5	78.5	79.5					
1	1976	1	1976-1	0.00472505	0.00472505	0.00472505	0.00472506	0.00472506	0.00472506	0.00472506	0.00472506	0.00472506	0.00472506	0.00472511	0.00472532	0.00472629	0.00473034	0.00474588	0.00480072	0.00497822	0.00550524	0.00693966	0.0105151	0.0186684	0.0356525	0.0679098	0.123623	0.210801	0.333709	0.488468	0.659886	0.82201	0.943783	0.998594	0.999992	0.997868	0.98936	0.974521	0.953639	0.927113	0.89544	0.859205	0.819053	0.775682	0.729811	0.682171	0.633478	0.584421	0.535643	0.487732	0.441207	0.396515	0.354023	0.314022	0.276722	0.242261	0.210707	0.182067	0.156292	0.133291	0.112932	0.0950588	0.0794918
1	1976	2	1976-1	0.00472505	0.00472505	0.00472505	0.00472506	0.00472506	0.00472506	0.00472506	0.00472506	0.00472506	0.00472511	0.00472532	0.00472629	0.00473034	0.00474588	0.00480072	0.00497822	0.00550524	0.00693966	0.0105151	0.0186684	0.0356525	0.0679098	0.123623	0.210801	0.333709	0.488468	0.659886	0.82201	0.943783	0.998594	0.999992	0.997868	0.98936	0.974521	0.953639	0.927113	0.89544	0.859205	0.819053	0.775682	0.729811	0.682171	0.633478	0.584421	0.535643	0.487732	0.441207	0.396515	0.354023	0.314022	0.276722	0.242261	0.210707	0.182067	0.156292	0.133291	0.112932	0.0950588	0.0794918	
1	1982	1	1982-1	0.0313759	0.0316043	0.0321774	0.0335242	0.0364867	0.0425817	0.0542995	0.0753266	0.110492	0.165189	0.2441	0.349267	0.477976	0.621243	0.763849	0.886514	0.969997	0.999998	0.999998	0.999998	0.996333	0.985202	0.966854	0.941699	0.910288	0.873295	0.831492	0.785726	0.736884	0.685872	0.633581	0.580867	0.528526	0.477278	0.427752	0.380477	0.335876	0.29427	0.255875	0.220814	0.189121	0.160756	0.135616	0.113546	0.0943507	0.07781	0.0636855	0.0517323	0.0417059	0.0333695	0.0264982	0.0208833	0.0163342	0.0126797	0.00976874	0.00746935				
1	1982	2	1982-1	0.0313759	0.0316043	0.0321774	0.0335242	0.0364867	0.0425817	0.0542995	0.0753266	0.110492	0.165189	0.2441	0.349267	0.477976	0.621243	0.763849	0.886514	0.969997	0.999998	0.999998	0.999998	0.996333	0.985202	0.966854	0.941699	0.910288	0.873295	0.831492	0.785726	0.736884	0.685872	0.633581	0.580867	0.528526	0.477278	0.427752	0.380477	0.335876	0.29427	0.255875	0.220814	0.189121	0.160756	0.135616	0.113546	0.0943507	0.07781	0.0636855	0.0517323	0.0417059	0.0333695	0.0264982	0.0208833	0.0163342	0.0126797	0.00976874	0.00746935				
1	1983	1	1983-1	0.00531785	0.00966146	0.0208528	0.046344	0.0975033	0.187531	0.325396	0.506804	0.707087	0.882956	0.986469	0.999982	0.999664	0.996981	0.991637	0.983675	0.973158	0.960169	0.944812	0.927205	0.907485	0.8858	0.862313	0.837196	0.81063	0.7828	0.753897	0.724112	0.693638	0.662663	0.631372	0.599945	0.568552	0.537356	0.506508	0.47615	0.446411	0.417405	0.389237	0.361996	0.335758	0.310585	0.286529	0.263627	0.241905	0.221376	0.202046	0.183909	0.166951	0.15115	0.136477	0.122898	0.110373	0.0988583	0.0883073					
1	1983	2	1983-1	0.00531785	0.00966146	0.0208528	0.046344	0.0975033	0.187531	0.325396	0.506804	0.707087	0.882956	0.986469	0.999982	0.999664	0.996981	0.991637	0.983675	0.973158	0.960169	0.944812	0.927205	0.907485	0.8858	0.862313	0.837196	0.81063	0.7828	0.753897	0.724112	0.693638	0.662663	0.631372	0.599945	0.568552	0.537356	0.506508	0.47615	0.446411	0.417405	0.389237	0.361996	0.335758	0.310585	0.286529	0.263627	0.241905	0.221376	0.202046	0.183909	0.166951	0.15115	0.136477	0.122898	0.110373	0.0988583	0.0883073					
1	1984	1	1984-1	0.015748	0.0183969	0.0223597	0.0281555	0.0364404	0.0480129	0.0638038	0.0848447	0.112212	0.14694	0.189908	0.241707	0.30249	0.371837	0.448637	0.531031	0.616416	0.701534	0.782654	0.855821	0.917173	0.963271	0.991424	0.999988	0.999988	0.997007	0.988886	0.975749	0.957798	0.935305	0.908608	0.878099	0.844217	0.807437	0.768258	0.727192	0.684754	0.641452																						

0.597775 0.554185 0.511111 0.468943 0.428024 0.388651 0.351072 0.315483  
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 1 1984 2 1984-1 0.015748 0.0183969 0.0223597 0.0281555 0.0364404 0.0480129  
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AGE\_SELEX

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5	2008	2	2008-5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
5	2009	1	2009-5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
5	2009	2	2009-5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1



3 2008 2 1 0.0851085 0.773797 0.273683 0.0877251 0.0200171 0.00730381  
0.00185304 0.000616616 0.000343731 0.000181017 9.7521e-005 5.24375e-005  
2.69089e-005 2.66531e-005 1.35845e-005 1.35845e-005  
4 2008 1 1 0.000469929 0.298601 1 1 0.0950864 4.07823e-007 3.30052e-007  
3.18342e-007 3.15362e-007 3.13636e-007 3.13028e-007 3.12493e-007 3.12101e-007  
3.11768e-007 3.11471e-007 3.11464e-007  
4 2008 2 1 0.000469928 0.00287614 0.999878 1 1 1 0.999998 0.0960082 2.5293e-  
005 1.46784e-006 5.59107e-007 4.07823e-007 3.59825e-007 3.59444e-007  
3.40011e-007 3.40011e-007  
5 2008 1 1 0.0306091 0.695913 0.972542 0.625307 0.287059 0.117702 0.0515613  
0.0197478 0.00966575 0.00445701 0.00295927 0.00187434 0.00122712 0.000792134  
0.000495497 0.000490233  
5 2008 2 1 0.0204062 0.336264 0.97528 0.972542 0.770999 0.604174 0.409891  
0.287119 0.234908 0.186442 0.148569 0.117702 0.090736 0.0903169 0.0689118  
0.0689117  
6 2008 1 1 0.010653 0.0374467 5.16652e-006 3.11191e-007 3.10321e-007  
3.09906e-007 3.09678e-007 3.09497e-007 3.09397e-007 3.09308e-007 3.09268e-007  
3.09227e-007 3.09193e-007 3.09161e-007 3.09129e-007 3.09128e-007  
6 2008 2 1 0.00896599 0.304782 0.00162766 5.16652e-006 3.14454e-007  
3.11124e-007 3.10601e-007 3.10321e-007 3.10202e-007 3.10086e-007 3.0999e-007  
3.09906e-007 3.09823e-007 3.09822e-007 3.09748e-007 3.09748e-007  
7 2008 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
7 2008 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
8 2008 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
8 2008 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
9 2008 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  
9 2008 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

AGE\_SELEX\_mortality\_in\_endyear

fleet year morph season label 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15  
1 2008 1 1 sel\*wt 0.000210331 0.0942739 0.812916 1.26166 1.42142 1.36342  
1.22172 1.02439 0.878171 0.731276 0.660107 0.585769 0.523639 0.465042  
0.407908 0.406451  
1 2008 1 1 sel\*ret\*wt 0.000210331 0.0942739 0.812916 1.26166 1.42142 1.36342  
1.22172 1.02439 0.878171 0.731276 0.660107 0.585769 0.523639 0.465042  
0.407908 0.406451  
1 2008 1 1 sel\_nums 0.00103779 0.190792 0.94057 0.96435 0.796766 0.607869  
0.463239 0.332813 0.258371 0.195396 0.168257 0.142014 0.121485 0.103302  
0.0866557 0.0862561  
1 2008 1 1 sel\*ret\_nums 0.00103779 0.190792 0.94057 0.96435 0.796766  
0.607869 0.463239 0.332813 0.258371 0.195396 0.168257 0.142014 0.121485  
0.103302 0.0866557 0.0862561  
1 2008 1 1 dead\_nums 0.00103779 0.190792 0.94057 0.96435 0.796766 0.607869  
0.463239 0.332813 0.258371 0.195396 0.168257 0.142014 0.121485 0.103302  
0.0866557 0.0862561  
1 2008 1 1 dead\*wt 0.000210331 0.0942739 0.812916 1.26166 1.42142 1.36342  
1.22172 1.02439 0.878171 0.731276 0.660107 0.585769 0.523639 0.465042  
0.407908 0.406451  
1 2008 2 1 sel\*wt 8.54612e-005 0.0187182 0.312652 0.812916 1.13718 1.2761  
1.38685 1.42141 1.42269 1.41173 1.39162 1.36342 1.32424 1.32333 1.27666  
1.27666  
1 2008 2 1 sel\*ret\*wt 8.54612e-005 0.0187182 0.312652 0.812916 1.13718  
1.2761 1.38685 1.42141 1.42269 1.41173 1.39162 1.36342 1.32424 1.32333  
1.27666 1.27666  
1 2008 2 1 sel\_nums 0.000473239 0.0496997 0.492282 0.94057 0.99439 0.957524  
0.877052 0.796809 0.751999 0.701469 0.654066 0.607869 0.558881 0.557952  
0.510487 0.510486

1 2008 2 1 sel\*ret\_nums 0.000473239 0.0496997 0.492282 0.94057 0.99439  
0.957524 0.877052 0.796809 0.751999 0.701469 0.654066 0.607869 0.558881  
0.557952 0.510487 0.510486  
1 2008 2 1 dead\_nums 0.000473239 0.0496997 0.492282 0.94057 0.99439 0.957524  
0.877052 0.796809 0.751999 0.701469 0.654066 0.607869 0.558881 0.557952  
0.510487 0.510486  
1 2008 2 1 dead\*wt 8.54612e-005 0.0187182 0.312652 0.812916 1.13718 1.2761  
1.38685 1.42141 1.42269 1.41173 1.39162 1.36342 1.32424 1.32333 1.27666  
1.27666  
2 2008 1 1 sel\*wt 9.32202e-006 0.0032103 0.288431 1.30779 1.52218 1.16475  
0.755939 0.402638 0.237134 0.127982 0.0909887 0.0614917 0.0424393 0.0286978  
0.0187033 0.0185158  
2 2008 1 1 sel\*ret\*wt 9.32202e-006 0.0032103 0.288431 1.30779 1.52218  
1.16475 0.755939 0.402638 0.237134 0.127982 0.0909887 0.0614917 0.0424393  
0.0286978 0.0187033 0.0185158  
2 2008 1 1 sel\_nums 4.59954e-005 0.00649702 0.333724 0.999617 0.85325  
0.519294 0.28663 0.130813 0.0697681 0.0341966 0.0231924 0.0149199 0.00985012  
0.00637475 0.00397332 0.00393045  
2 2008 1 1 sel\*ret\_nums 4.59954e-005 0.00649702 0.333724 0.999617 0.85325  
0.519294 0.28663 0.130813 0.0697681 0.0341966 0.0231924 0.0149199 0.00985012  
0.00637475 0.00397332 0.00393045  
2 2008 1 1 dead\_nums 4.59954e-005 0.00649702 0.333724 0.999617 0.85325  
0.519294 0.28663 0.130813 0.0697681 0.0341966 0.0231924 0.0149199 0.00985012  
0.00637475 0.00397332 0.00393045  
2 2008 1 1 dead\*wt 9.32202e-006 0.0032103 0.288431 1.30779 1.52218 1.16475  
0.755939 0.402638 0.237134 0.127982 0.0909887 0.0614917 0.0424393 0.0286978  
0.0187033 0.0185158  
2 2008 2 1 sel\*wt 8.22712e-006 0.00020308 0.0315954 0.288431 0.998455  
1.33279 1.52356 1.5222 1.47169 1.38383 1.28038 1.16475 1.03087 1.02822  
0.892525 0.892525  
2 2008 2 1 sel\*ret\*wt 8.22712e-006 0.00020308 0.0315954 0.288431 0.998455  
1.33279 1.52356 1.5222 1.47169 1.38383 1.28038 1.16475 1.03087 1.02822  
0.892525 0.892525  
2 2008 2 1 sel\_nums 4.55586e-005 0.000539208 0.0497463 0.333724 0.872837  
0.999721 0.963505 0.853314 0.7779 0.687771 0.601911 0.519294 0.435069  
0.433568 0.356885 0.356885  
2 2008 2 1 sel\*ret\_nums 4.55586e-005 0.000539208 0.0497463 0.333724 0.872837  
0.999721 0.963505 0.853314 0.7779 0.687771 0.601911 0.519294 0.435069  
0.433568 0.356885 0.356885  
2 2008 2 1 dead\_nums 4.55586e-005 0.000539208 0.0497463 0.333724 0.872837  
0.999721 0.963505 0.853314 0.7779 0.687771 0.601911 0.519294 0.435069  
0.433568 0.356885 0.356885  
2 2008 2 1 dead\*wt 8.22712e-006 0.00020308 0.0315954 0.288431 0.998455  
1.33279 1.52356 1.5222 1.47169 1.38383 1.28038 1.16475 1.03087 1.02822  
0.892525 0.892525  
3 2008 1 1 sel\*wt 0.0127971 0.231939 0.783345 1.29362 1.19494 0.737677  
0.402909 0.178753 0.0926004 0.0436591 0.0289006 0.0180235 0.0114881  
0.00710055 0.00413622 0.00408449  
3 2008 1 1 sel\*ret\*wt 0.0127971 0.231939 0.783345 1.29362 1.19494 0.737677  
0.402909 0.178753 0.0926004 0.0436591 0.0289006 0.0180235 0.0114881  
0.00710055 0.00413622 0.00408449  
3 2008 1 1 sel\_nums 0.0631418 0.469398 0.906356 0.988779 0.669816 0.328888  
0.152771 0.0580749 0.0272444 0.0116657 0.00736656 0.00437401 0.00266668  
0.00157727 0.000878695 0.00086713  
3 2008 1 1 sel\*ret\_nums 0.0631418 0.469398 0.906356 0.988779 0.669816  
0.328888 0.152771 0.0580749 0.0272444 0.0116657 0.00736656 0.00437401  
0.00266668 0.00157727 0.000878695 0.00086713

3 2008 1 1 dead\_nums 0.0631418 0.469398 0.906356 0.988779 0.669816 0.328888  
0.152771 0.0580749 0.0272444 0.0116657 0.00736656 0.00437401 0.00266668  
0.00157727 0.000878695 0.00086713  
3 2008 1 1 dead\*wt 0.0127971 0.231939 0.783345 1.29362 1.19494 0.737677  
0.402909 0.178753 0.0926004 0.0436591 0.0289006 0.0180235 0.0114881  
0.00710055 0.00413622 0.00408449  
3 2008 2 1 sel\*wt 0.0076963 0.108648 0.427101 0.783345 1.14341 1.30521  
1.32296 1.19502 1.0967 0.974247 0.854646 0.737677 0.61709 0.614927 0.504422  
0.504421  
3 2008 2 1 sel\*ret\*wt 0.0076963 0.108648 0.427101 0.783345 1.14341 1.30521  
1.32296 1.19502 1.0967 0.974247 0.854646 0.737677 0.61709 0.614927 0.504422  
0.504421  
3 2008 2 1 sel\_nums 0.0426187 0.288476 0.6725 0.906356 0.99982 0.979473  
0.836646 0.669905 0.579691 0.484298 0.40183 0.328888 0.260436 0.259308  
0.201698 0.201698  
3 2008 2 1 sel\*ret\_nums 0.0426187 0.288476 0.6725 0.906356 0.99982 0.979473  
0.836646 0.669905 0.579691 0.484298 0.40183 0.328888 0.260436 0.259308  
0.201698 0.201698  
3 2008 2 1 dead\_nums 0.0426187 0.288476 0.6725 0.906356 0.99982 0.979473  
0.836646 0.669905 0.579691 0.484298 0.40183 0.328888 0.260436 0.259308  
0.201698 0.201698  
3 2008 2 1 dead\*wt 0.0076963 0.108648 0.427101 0.783345 1.14341 1.30521  
1.32296 1.19502 1.0967 0.974247 0.854646 0.737677 0.61709 0.614927 0.504422  
0.504421  
4 2008 1 1 sel\*wt 9.52419e-005 0.147545 0.86428 1.3083 0.169633 9.14725e-007  
8.70459e-007 9.79846e-007 1.07188e-006 1.17379e-006 1.22807e-006 1.28969e-006  
1.34567e-006 1.40351e-006 1.46617e-006 1.46796e-006  
4 2008 1 1 sel\*ret\*wt 9.52419e-005 0.147545 0.86428 1.3083 0.169633  
9.14725e-007 8.70459e-007 9.79846e-007 1.07188e-006 1.17379e-006 1.22807e-006  
1.28969e-006 1.34567e-006 1.40351e-006 1.46617e-006 1.46796e-006  
4 2008 1 1 sel\_nums 0.000469929 0.298601 1 1 0.0950864 4.07823e-007  
3.30052e-007 3.18342e-007 3.15362e-007 3.13636e-007 3.13028e-007 3.12493e-007  
3.12101e-007 3.11768e-007 3.11471e-007 3.11464e-007  
4 2008 1 1 sel\*ret\_nums 0.000469929 0.298601 1 1 0.0950864 4.07823e-007  
3.30052e-007 3.18342e-007 3.15362e-007 3.13636e-007 3.13028e-007 3.12493e-007  
3.12101e-007 3.11768e-007 3.11471e-007 3.11464e-007  
4 2008 1 1 dead\_nums 0.000469929 0.298601 1 1 0.0950864 4.07823e-007  
3.30052e-007 3.18342e-007 3.15362e-007 3.13636e-007 3.13028e-007 3.12493e-007  
3.12101e-007 3.11768e-007 3.11471e-007 3.11464e-007  
4 2008 1 1 dead\*wt 9.52419e-005 0.147545 0.86428 1.3083 0.169633 9.14725e-  
007 8.70459e-007 9.79846e-007 1.07188e-006 1.17379e-006 1.22807e-006  
1.28969e-006 1.34567e-006 1.40351e-006 1.46617e-006 1.46796e-006  
4 2008 2 1 sel\*wt 8.48611e-005 0.00108323 0.635011 0.86428 1.14361 1.33315  
1.58126 0.171172 4.78513e-005 2.94696e-006 1.18881e-006 9.14725e-007  
8.52586e-007 8.52543e-007 8.50327e-007 8.50327e-007  
4 2008 2 1 sel\*ret\*wt 8.48611e-005 0.00108323 0.635011 0.86428 1.14361  
1.33315 1.58126 0.171172 4.78513e-005 2.94696e-006 1.18881e-006 9.14725e-007  
8.52586e-007 8.52543e-007 8.50327e-007 8.50327e-007  
4 2008 2 1 sel\_nums 0.000469928 0.00287614 0.999878 1 1 1 0.999998 0.0960082  
2.5293e-005 1.46784e-006 5.59107e-007 4.07823e-007 3.59825e-007 3.59444e-007  
3.40011e-007 3.40011e-007  
4 2008 2 1 sel\*ret\_nums 0.000469928 0.00287614 0.999878 1 1 1 0.999998  
0.0960082 2.5293e-005 1.46784e-006 5.59107e-007 4.07823e-007 3.59825e-007  
3.59444e-007 3.40011e-007 3.40011e-007  
4 2008 2 1 dead\_nums 0.000469928 0.00287614 0.999878 1 1 1 0.999998  
0.0960082 2.5293e-005 1.46784e-006 5.59107e-007 4.07823e-007 3.59825e-007  
3.59444e-007 3.40011e-007 3.40011e-007



4 2008 2 1 dead\*wt 8.48611e-005 0.00108323 0.635011 0.86428 1.14361 1.33315  
1.58126 0.171172 4.78513e-005 2.94696e-006 1.18881e-006 9.14725e-007  
8.52586e-007 8.52543e-007 8.50327e-007 8.50327e-007  
5 2008 1 1 sel\*wt 6.36883e-005 0.0155219 0.596821 1.28355 1.28888 0.969716  
0.663247 0.393652 0.257037 0.15766 0.120613 0.0887503 0.0665544 0.0491918  
0.035364 0.035078  
5 2008 1 1 sel\*ret\*wt 6.36883e-005 0.0155219 0.596821 1.28355 1.28888  
0.969716 0.663247 0.393652 0.257037 0.15766 0.120613 0.0887503 0.0665544  
0.0491918 0.035364 0.035078  
5 2008 1 1 sel\_nums 0.000314242 0.0314132 0.690541 0.981084 0.722475  
0.432341 0.251484 0.127893 0.0756241 0.0421267 0.0307435 0.0215287 0.0154453  
0.0109272 0.0075127 0.0074456  
5 2008 1 1 sel\*ret\_nums 0.000314242 0.0314132 0.690541 0.981084 0.722475  
0.432341 0.251484 0.127893 0.0756241 0.0421267 0.0307435 0.0215287 0.0154453  
0.0109272 0.0075127 0.0074456  
5 2008 1 1 dead\_nums 0.000314242 0.0314132 0.690541 0.981084 0.722475  
0.432341 0.251484 0.127893 0.0756241 0.0421267 0.0307435 0.0215287 0.0154453  
0.0109272 0.0075127 0.0074456  
5 2008 1 1 dead\*wt 6.36883e-005 0.0155219 0.596821 1.28355 1.28888 0.969716  
0.663247 0.393652 0.257037 0.15766 0.120613 0.0887503 0.0665544 0.0491918  
0.035364 0.035078  
5 2008 2 1 sel\*wt 5.6007e-005 0.00130076 0.109735 0.596821 1.14344 1.29586  
1.3503 1.28893 1.22939 1.14748 1.06086 0.969716 0.867996 0.866014 0.764758  
0.764758  
5 2008 2 1 sel\*ret\*wt 5.6007e-005 0.00130076 0.109735 0.596821 1.14344  
1.29586 1.3503 1.28893 1.22939 1.14748 1.06086 0.969716 0.867996 0.866014  
0.764758 0.764758  
5 2008 2 1 sel\_nums 0.000310145 0.0034537 0.172777 0.690541 0.99984 0.972433  
0.853935 0.722545 0.649827 0.570303 0.498709 0.432341 0.366328 0.365166  
0.305796 0.305796  
5 2008 2 1 sel\*ret\_nums 0.000310145 0.0034537 0.172777 0.690541 0.99984  
0.972433 0.853935 0.722545 0.649827 0.570303 0.498709 0.432341 0.366328  
0.365166 0.305796 0.305796  
5 2008 2 1 dead\_nums 0.000310145 0.0034537 0.172777 0.690541 0.99984  
0.972433 0.853935 0.722545 0.649827 0.570303 0.498709 0.432341 0.366328  
0.365166 0.305796 0.305796  
5 2008 2 1 dead\*wt 5.6007e-005 0.00130076 0.109735 0.596821 1.14344 1.29586  
1.3503 1.28893 1.22939 1.14748 1.06086 0.969716 0.867996 0.866014 0.764758  
0.764758  
6 2008 1 1 sel\*wt 0.0203739 0.423259 0.5581 0.0154998 3.16756e-005 7.25746e-  
007 8.20239e-007 9.55567e-007 1.05429e-006 1.16007e-006 1.2157e-006 1.2785e-  
006 1.33535e-006 1.39392e-006 1.45722e-006 1.45902e-006  
6 2008 1 1 sel\*ret\*wt 0.0203739 0.423259 0.5581 0.0154998 3.16756e-005  
7.25746e-007 8.20239e-007 9.55567e-007 1.05429e-006 1.16007e-006 1.2157e-006  
1.2785e-006 1.33535e-006 1.39392e-006 1.45722e-006 1.45902e-006  
6 2008 1 1 sel\_nums 0.100526 0.856592 0.64574 0.0118473 1.77555e-005  
3.23569e-007 3.11011e-007 3.10454e-007 3.10186e-007 3.09968e-007 3.09874e-007  
3.09781e-007 3.09706e-007 3.09637e-007 3.0957e-007 3.09568e-007  
6 2008 1 1 sel\*ret\_nums 0.100526 0.856592 0.64574 0.0118473 1.77555e-005  
3.23569e-007 3.11011e-007 3.10454e-007 3.10186e-007 3.09968e-007 3.09874e-007  
3.09781e-007 3.09706e-007 3.09637e-007 3.0957e-007 3.09568e-007  
6 2008 1 1 dead\_nums 0.100526 0.856592 0.64574 0.0118473 1.77555e-005  
3.23569e-007 3.11011e-007 3.10454e-007 3.10186e-007 3.09968e-007 3.09874e-007  
3.09781e-007 3.09706e-007 3.09637e-007 3.0957e-007 3.09568e-007  
6 2008 1 1 dead\*wt 0.0203739 0.423259 0.5581 0.0154998 3.16756e-005  
7.25746e-007 8.20239e-007 9.55567e-007 1.05429e-006 1.16007e-006 1.2157e-006  
1.2785e-006 1.33535e-006 1.39392e-006 1.45722e-006 1.45902e-006

6 2008 2 1 sel\*wt 0.0116556 0.211905 0.634492 0.5581 0.0841087 0.012687  
0.000530757 3.17826e-005 6.91661e-006 1.70038e-006 8.39409e-007 7.25746e-007  
7.41453e-007 7.42169e-007 7.78733e-007 7.78733e-007  
6 2008 2 1 sel\*ret\*wt 0.0116556 0.211905 0.634492 0.5581 0.0841087 0.012687  
0.000530757 3.17826e-005 6.91661e-006 1.70038e-006 8.39409e-007 7.25746e-007  
7.41453e-007 7.42169e-007 7.78733e-007 7.78733e-007  
6 2008 2 1 sel\_nums 0.0645435 0.562639 0.999064 0.64574 0.073692 0.00962032  
0.000335654 1.78203e-005 3.65595e-006 8.46625e-007 3.94665e-007 3.23569e-007  
3.12922e-007 3.12892e-007 3.11384e-007 3.11384e-007  
6 2008 2 1 sel\*ret\_nums 0.0645435 0.562639 0.999064 0.64574 0.073692  
0.00962032 0.000335654 1.78203e-005 3.65595e-006 8.46625e-007 3.94665e-007  
3.23569e-007 3.12922e-007 3.12892e-007 3.11384e-007 3.11384e-007  
6 2008 2 1 dead\_nums 0.0645435 0.562639 0.999064 0.64574 0.073692 0.00962032  
0.000335654 1.78203e-005 3.65595e-006 8.46625e-007 3.94665e-007 3.23569e-007  
3.12922e-007 3.12892e-007 3.11384e-007 3.11384e-007  
6 2008 2 1 dead\*wt 0.0116556 0.211905 0.634492 0.5581 0.0841087 0.012687  
0.000530757 3.17826e-005 6.91661e-006 1.70038e-006 8.39409e-007 7.25746e-007  
7.41453e-007 7.42169e-007 7.78733e-007 7.78733e-007

ENVIRONMENTAL\_DATA Begins\_in\_startyr-1

NUMBERS\_AT\_AGE

Population 1 gmorph 1 gender: 1 GrowPattern: 1 birthseason: 1  
Year Per Seas 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15  
1974 VIRG 1 28066.2 21055 15795.2 11849.4 8889.33 6668.69 5002.78 3753.04  
2815.49 2112.15 1584.52 1188.69 891.742 668.976 501.859 1506.9  
1975 INIT 1 26974.6 20167 15053.3 8869.65 3226.6 1237.35 529.469 251.124  
132.357 74.5214 44.5393 27.3484 17.2519 11.122 7.31347 14.8591  
1976 TIME 1 31306 22543.1 21034.4 7020.87 2652.53 895.855 275.01 251.124  
132.357 74.5214 44.5393 27.3484 17.2519 11.122 7.31347 14.8591  
1977 TIME 1 26934 23190.5 13818.7 9598.64 2378.98 1049.05 409.367 139.515  
140.188 78.2181 46.3171 28.3146 17.7809 11.4207 7.48442 15.1566  
1978 TIME 1 22762.4 19945.9 13934.5 6398.77 3669.66 1063.86 533.668 227.038  
83.4673 87.6589 50.8425 30.6314 19.0497 12.1285 7.88808 15.8255  
1979 TIME 1 16075 16825.3 11490.2 6168.22 2482.5 1698.62 561.866 306.072  
139.553 53.3712 58.0064 34.1595 20.8927 13.1508 8.46487 16.7242  
1980 TIME 1 33222.8 11792.2 8490.42 3740.16 1560.18 831.009 704.641 267.157  
163.472 79.6869 32.3054 36.0335 21.7726 13.5938 8.71809 16.9997  
1981 TIME 1 34419 24142.7 4956.36 2023.04 700.749 431.549 304.685 306.702  
133.998 88.8357 46.4141 19.4035 22.3108 13.8129 8.8165 17.0346  
1982 TIME 1 42914.8 25049.5 10620.6 1136.37 272.082 137.302 116.813 103.058  
126.509 62.0975 45.6073 24.9428 10.9115 13.0115 8.32637 16.083  
1983 TIME 1 42224.9 29814 9567.43 3178.24 439.155 140.741 84.3103 77.8849  
72.3459 90.7978 45.2573 33.4299 18.3751 8.06763 9.64886 18.1472  
1984 TIME 1 23956.7 29441.1 9849.83 2729.16 1200.29 222.328 83.6259 53.9077  
52.1644 49.5145 63.2057 31.7319 23.6049 13.0482 5.75854 19.9405  
1985 TIME 1 32124.1 16568.9 11058.7 1906.32 638.946 396.389 92.8841 40.0865  
28.866 29.7193 29.7703 38.9275 20.0189 15.1842 8.54466 17.1236  
1986 TIME 1 31700.5 23361.1 6177.62 2393.26 532.274 247.312 189.325 49.8384  
23.5056 17.751 19.0237 19.3945 25.8051 13.4569 10.3375 17.6903  
1987 TIME 1 23200 22848.7 8038.89 1044.37 529.034 165.607 95.8023 83.0177  
24.1476 12.0634 9.59776 10.539 11.0182 14.972 7.96568 16.9298  
1988 TIME 1 6644.89 16899.9 8134.14 1795.88 288.281 187.646 68.8276 43.5524  
40.605 12.3308 6.41142 5.19909 5.82463 6.19427 8.55742 14.474  
1989 TIME 1 16921.6 4652.15 4147.99 916.104 274.258 63.9359 52.1876 21.6368  
15.1034 14.9277 4.79148 2.55946 2.13639 2.45408 2.67499 10.2067

1990 TIME 1 20003.2 12326.9 1502.37 512.519 70.9539 31.2315 12.4893 14.817  
8.12624 6.48666 7.09761 2.37515 1.32038 1.13735 1.34431 7.25534  
1991 TIME 1 22765.3 14030.1 4406.96 312.567 70.8522 13.8865 9.76622 5.33293  
7.87164 4.75052 4.04899 4.54014 1.5529 0.877357 0.766255 5.86775  
1992 TIME 1 25160.7 16714.9 4518.78 577.735 50.7105 19.2011 5.85018 5.37144  
3.47965 5.4843 3.43746 2.96416 3.35288 1.15295 0.653785 4.95619  
1993 TIME 1 19602.4 18147.2 4876.58 597.619 75.3311 11.7466 7.32225 3.0412  
3.4144 2.39058 3.94114 2.50472 2.18243 2.48441 0.858046 4.18782  
1994 TIME 1 24520.9 14037.4 6172.89 797.662 117.64 24.2506 5.61817 4.34285  
2.05513 2.42294 1.74473 2.90144 1.85607 1.6238 1.85366 3.77233  
1995 TIME 1 34425.6 17622.9 4616.77 838.122 185.641 42.9854 12.1499 3.3938  
2.95629 1.46444 1.77263 1.28683 2.15301 1.38242 1.2125 4.20841  
1996 TIME 1 26331.1 25514.1 9398.06 1036.46 156.002 49.2895 17.3206 6.44543  
2.16479 2.02925 1.05011 1.28882 0.945593 1.59262 1.02738 4.04226  
1997 TIME 1 27749.1 19583.3 15156.7 3109.43 297.322 54.7167 22.5323 9.44987  
3.99171 1.41915 1.384 0.7269 0.903954 0.669639 1.137 3.64559  
1998 TIME 1 31445.8 20781.3 13313.3 6552.8 1071.69 117.37 25.8491 12.0733  
5.59177 2.48421 0.919064 0.911317 0.486335 0.612417 0.458803 3.31221  
1999 TIME 1 24709.2 23535.2 14325 6069.83 2402.53 449.566 59.3623 14.9374  
7.7392 3.76917 1.7371 0.651746 0.654346 0.352353 0.446974 2.76969  
2000 TIME 1 28909.4 18458.9 16763.9 7618.57 2735.63 1197.16 254.046 36.617  
9.86423 5.28649 2.64186 1.23024 0.466033 0.471314 0.255396 2.34499  
2001 TIME 1 28745.9 21677 12898.8 8348.74 3415.89 1370.11 687.304 159.648  
24.5797 6.82689 3.74 1.88493 0.884529 0.337 0.342493 1.8981  
2002 TIME 1 29273.8 21535.2 14720.9 7062.46 4464.44 1963.08 855.949 454  
109.936 17.2657 4.86707 2.68219 1.3593 0.640584 0.244974 1.63451  
2003 TIME 1 20641.8 21928.9 15261.9 8182.49 3836.01 2648.62 1278.8 591.116  
326.309 80.3655 12.7605 3.61067 1.99597 1.01364 0.478445 1.40552  
2004 TIME 1 28272 15452.5 15444.4 8455.43 4272.8 2165.64 1645.61 847.187  
410.668 231.811 58.0216 9.27032 2.63791 1.46432 0.746269 1.3914  
2005 TIME 1 12517.8 21172.3 10902.9 8216.73 4312.56 2371.96 1332.67 1085.2  
588.026 291.929 167.631 42.232 6.78692 1.93948 1.08043 1.58216  
2006 TIME 1 9803.48 9306.84 14971.5 6317.95 4138.58 2272.93 1355.87 807.611  
689.049 382.549 193.749 112.23 28.5228 4.61673 1.32823 1.83581  
2007 TIME 1 8062.55 7321.92 6539.76 8378.54 3258.51 2315.92 1408.39 899.513  
563.276 491.786 277.517 141.419 82.3628 21.0148 3.41254 2.34537  
2008 TIME 1 23442.9 5990.02 4931.42 3601.14 4457.54 1875.22 1462.6 945.987  
632.035 404.08 358.011 203.146 104.027 60.8006 15.5586 4.27371  
2009 FORE 1 28066.2 16908.5 3225.39 2461.1 1845.01 2632.64 1205.71 982.945  
656.541 446.023 289.104 257.669 147.059 75.6534 44.4004 14.5392  
Population 1 gmorph 2 gender:2 GrowPattern: 2 birthseason: 1  
Year Per Seas 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15  
1974 VIRG 1 42099.3 24518.1 14279 8315.9 4843.07 2820.54 1642.64 956.653  
557.142 324.472 188.968 110.053 64.0931 37.327 21.7387 30.316  
1975 INIT 1 40462 23484.1 13629.4 7735.54 3538.39 1043.5 294.824 84.8103  
25.2481 7.6908 2.41023 0.77729 0.258209 0.0886702 0.0304699 0.0168034  
1976 TIME 1 46958.9 26250.9 19044.7 6123.15 2908.85 755.506 153.134 84.8103  
25.2481 7.6908 2.41023 0.77729 0.258209 0.0886702 0.0304699 0.0168034  
1977 TIME 1 40401 27096.7 13445.5 8195.52 2169.17 757.438 200.179 43.8924  
26.038 8.03498 2.54487 0.826431 0.275739 0.0949141 0.0326158 0.0179942  
1978 TIME 1 34143.5 23314.1 13736.3 5640.33 2946.09 628.629 226.591 65.0197  
15.2373 9.34525 2.98696 0.976092 0.326379 0.112203 0.0386437 0.0211959  
1979 TIME 1 24112.5 19680.9 11500.2 5435.22 1938.26 854.942 191.116 75.7245  
23.3637 5.67117 3.60659 1.18974 0.400203 0.137761 0.0473847 0.0259608  
1980 TIME 1 49834.2 13826.8 9011.67 3716.58 1373.47 360.73 170.353 44.213  
19.6774 6.42579 1.65428 1.10767 0.383143 0.135198 0.0465797 0.0259304

1981 TIME 1 51628.5 28394.9 5663.74 2239.2 687.478 182.915 53.5784 31.2154  
 9.49318 4.55855 1.60887 0.442968 0.315279 0.115896 0.0409407 0.0232225  
 1982 TIME 1 64372.2 29422.9 12287.6 1493.35 398.558 68.3909 19.4568 6.93069  
 4.74775 1.56776 0.821894 0.313874 0.0930832 0.0715309 0.0263323 0.0156809  
 1983 TIME 1 63337.3 35452.3 11387.8 2887.9 346.928 106.696 20.8748 6.99262  
 2.78299 2.00375 0.694408 0.378729 0.149623 0.0457925 0.0352083 0.0212411  
 1984 TIME 1 35935 35281.5 10976.7 2504.12 639.524 90.1453 31.8449 7.35837  
 2.7481 1.147 0.864115 0.310591 0.174699 0.070995 0.0217383 0.0274431  
 1985 TIME 1 48186.1 19523.9 14265.9 2111.59 376.239 103.296 16.7002 7.11894  
 1.88637 0.751398 0.334707 0.266583 0.100734 0.0595214 0.0242099 0.0175407  
 1986 TIME 1 47550.7 27441.1 8328.81 2672.89 354.76 72.2959 22.8142 4.41848  
 2.139 0.601083 0.253854 0.118795 0.0988457 0.0389681 0.0230424 0.0167879  
 1987 TIME 1 34800 26969 10327.4 1420.82 350.795 53.6166 12.6534 4.82551  
 1.06716 0.549184 0.164017 0.0729244 0.0357246 0.0310832 0.0122637 0.0130517  
 1988 TIME 1 9967.33 19841.5 11093.5 1843.91 246.412 68.3013 11.6588 3.16327  
 1.32867 0.307147 0.165181 0.051199 0.0235287 0.0119042 0.0103635 0.00869071  
 1989 TIME 1 25382.3 5535.26 6262.1 1201.72 161.218 25.3256 8.27694 1.74057  
 0.544597 0.243967 0.0600761 0.0340536 0.0110543 0.00531127 0.00268931  
 0.00447959  
 1990 TIME 1 30004.8 14542.7 2134.23 853.527 115.27 10.0728 1.54168 0.591995  
 0.153856 0.0546849 0.0283482 0.00799919 0.00516412 0.00191497 0.000922305  
 0.00140772  
 1991 TIME 1 34148 16961.4 5285.56 451.132 137.855 12.7379 1.09362 0.193958  
 0.0899351 0.0261495 0.0105569 0.00615653 0.00194187 0.00140296 0.000521293  
 0.00070269  
 1992 TIME 1 37741 19651.5 6494.72 678.261 45.9127 14.7982 1.65239 0.185678  
 0.040801 0.0211663 0.00694619 0.00312476 0.00201351 0.000700832 0.000507206  
 0.000483002  
 1993 TIME 1 29403.6 21710.4 7356.56 825.385 69.6369 4.18365 1.5504 0.23464  
 0.0333857 0.00831251 0.00494164 0.00183404 0.000925072 0.000667958  
 0.000232957 0.00036444  
 1994 TIME 1 36781.3 16779.8 8376.89 1095.51 104.809 9.27755 0.655868  
 0.313817 0.0586331 0.00927545 0.00257816 0.00168547 0.000680974 0.000372578  
 0.000269396 0.000258524  
 1995 TIME 1 51638.5 20737 6520.63 926.606 115.471 15.5209 1.72168 0.15215  
 0.0890081 0.0180922 0.00311677 0.000934842 0.000655558 0.000283834 0.00015548  
 0.000234267  
 1996 TIME 1 39496.6 29839.8 11076.9 1457.82 161.491 16.489 2.27535 0.2939  
 0.0313577 0.0202964 0.00461741 0.000883071 0.000292429 0.000226619 9.82923e-  
 005 0.000147758  
 1997 TIME 1 41623.7 22882.9 16078.5 3586.26 374.444 36.0251 3.69359 0.553839  
 0.0800205 0.00910209 0.0063303 0.00153894 0.000313391 0.000110594 8.58033e-  
 005 9.87367e-005  
 1998 TIME 1 47168.6 24217.7 12913 7344.01 1203.66 101.171 9.67407 1.04917  
 0.169721 0.0256007 0.00305659 0.00222375 0.000564402 0.000120144 4.24326e-005  
 7.37942e-005  
 1999 TIME 1 37063.8 27428.7 13766.6 6056.03 2599.34 347.028 28.8917 2.91502  
 0.341658 0.0577758 0.00916451 0.00114698 0.000873134 0.000232232 4.94775e-005  
 5.0008e-005  
 2000 TIME 1 43364.1 21516 15712.7 6937.28 2500.39 914.004 121.698 10.5134  
 1.12758 0.136288 0.0238363 0.00390148 0.000503172 0.000395054 0.000105134  
 4.63535e-005  
 2001 TIME 1 43118.8 25245.5 12345.1 7557.72 2682.11 870.143 319.181 44.5327  
 4.08757 0.453312 0.0568597 0.0102885 0.00173887 0.000231654 0.000181984  
 7.18864e-005

2002 TIME 1 43910.7 25093.5 14207.5 5879.92 3212.47 1109 361.966 136.613  
19.8675 1.86184 0.211173 0.0270417 0.00498985 0.000860288 0.00011465  
0.000127967  
2003 TIME 1 30962.7 25539.3 14445.9 6956.8 2537.25 1341.32 469.136 159.268  
62.9178 9.36897 0.900667 0.104534 0.0136753 0.00257775 0.00044459 0.00012781  
2004 TIME 1 42407.9 18004.6 14553.1 7258.84 2992.11 1026.28 545.08 197.151  
69.8017 28.2265 4.31377 0.424721 0.05042 0.00674908 0.0012727 0.00028863  
2005 TIME 1 18776.7 24655.7 10357.8 7119.19 2998.02 1179.49 407.491 224.542  
84.9619 30.8453 12.8265 2.01128 0.202899 0.0246895 0.00330634 0.000782475  
2006 TIME 1 14705.2 10865.8 13887.4 5364.47 3202.61 1201.14 460.95 161.287  
91.8711 35.4327 13.1474 5.58047 0.89253 0.0919017 0.0111872 0.0018886  
2007 TIME 1 12093.8 8539.67 6140.98 7043.83 2330.61 1282.84 482.118 191.528  
70.0648 40.9121 16.2209 6.17394 2.6844 0.439959 0.0453214 0.00659462  
2008 TIME 1 35164.3 6999.41 4689.59 2975.32 3011.11 957.562 531.176 206.44  
85.565 32.0254 19.1773 7.78126 3.02695 1.34549 0.220606 0.0265643  
2009 FORE 1 42099.3 19919.6 2029.44 1895.05 1152.74 1145.18 383.904 229.836  
94.6489 40.2057 15.4078 9.40939 3.88399 1.53583 0.682873 0.127267

CATCH\_AT\_AGE

fleet 1 fleetarea 1 gmorph 1  
Year Seas 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15  
1975 E 80.0468 87.8272 2823.56 4039.05 1392.7 468.188 171.091 65.4643  
28.8959 13.2395 7.05966 3.79774 2.11648 1.1972 0.681696 1.37969  
1976 1 76.1605 73.7273 2898.98 2556.25 955.095 287.162 75.3778 55.3143  
24.3224 11.0991 5.90679 3.17113 1.76433 0.996462 0.566556 1.14661  
1977 1 49.7948 57.1205 1456.77 2793.09 686.269 267.928 88.7513 24.1036  
20.0938 9.0397 4.75503 2.53544 1.40155 0.787239 0.445322 0.898264  
1978 1 36.7011 42.0677 1257.41 1635.4 938.012 241.169 102.539 34.6663  
10.5515 8.91688 4.58987 2.40965 1.31809 0.733351 0.411419 0.822147  
1979 1 44.2543 57.3 1561.26 2271.29 947.937 593.711 170.148 75.136 28.703  
8.92787 8.653 4.46183 2.40968 1.33018 0.741051 1.45844  
1980 1 107.11 43.621 1199.26 1446.46 648.917 324.3 241.541 75.0176 38.6769  
15.4073 5.58188 5.46293 2.91959 1.60105 0.889969 1.72872  
1981 1 167.034 136.998 1037.65 1046.31 384.221 223.971 141.264 118.98  
44.4397 24.4099 11.4702 4.2348 4.32971 2.36592 1.31498 2.53126  
1982 1 556.886 4240.48 2578.94 244.51 44.6869 15.4872 8.99884 4.99508  
4.31074 1.43867 0.860613 0.373562 0.132127 0.12646 0.0638533 0.122597  
1983 1 1127.43 5861.96 1613.68 499.496 62.3344 17.0402 8.63081 6.50065  
5.17751 5.50024 2.51061 1.67968 0.843731 0.337638 0.365468 0.685506  
1984 1 506.585 4843.35 3078 987.742 442.068 74.8284 24.5583 13.0445 10.758  
8.49501 9.80164 4.37946 2.92277 1.4416 0.561494 1.93777  
1985 1 288.44 3487.07 3830.71 655.672 204.361 108.909 21.4153 7.37589  
4.45033 3.76138 3.38809 3.92544 1.80577 1.21973 0.605166 1.20866  
1986 1 169.711 4038.26 2233.63 924.122 210.175 92.5062 64.8481 15.0616  
6.41172 4.30759 4.33097 4.1027 5.09975 2.47652 1.75969 3.00484  
1987 1 116.542 5582.52 2981.52 394.56 198.696 58.8741 31.6465 24.8644  
6.69295 3.06596 2.32801 2.42352 2.41249 3.11512 1.56778 3.32693  
1988 1 124.236 5125.86 3557.19 846.805 145.611 95.2652 33.9264 20.3652  
18.1401 5.22463 2.63868 2.06902 2.24689 2.31268 3.08241 5.20831  
1989 1 41.6401 1502.69 1880.89 330.903 97.6596 23.4931 19.1241 7.49892  
4.88235 4.39661 1.33665 0.669525 0.525961 0.56655 0.575248 2.19061  
1990 1 8.36669 2577.57 385.199 101.045 13.1795 5.67122 2.14359 2.25746  
1.10247 0.763653 0.771788 0.235561 0.120217 0.0946893 0.101514 0.546423  
1991 1 5.38614 3346.44 1448.6 29.5983 0.868522 0.0161903 0.00123934  
4.88308e-005 9.96116e-006 7.0661e-007 1.99801e-007 7.34555e-008 1.06966e-008  
3.51155e-009 2.38195e-009 1.81953e-008

1992 1 109.357 5937.95 2010.58 67.017 0.637837 0.0178895 0.000461444  
 2.23799e-005 1.58017e-006 2.39186e-007 5.09654e-008 1.93201e-008 1.50091e-008  
 4.48881e-009 2.417e-009 1.831e-008  
 1993 1 80.1387 4176.24 1432.97 124.845 9.71471 0.840281 0.287898 0.0568463  
 0.0359658 0.0133896 0.0157657 0.00687023 0.00422067 0.00334735 0.000784181  
 0.00379236  
 1994 1 60.909 3325.01 2417.94 69.2712 0.751001 0.00774556 0.000110471  
 3.27593e-006 1.42325e-007 2.05153e-008 8.58091e-009 1.14716e-008 6.86491e-009  
 5.83283e-009 6.52612e-009 1.32749e-008  
 1995 1 14.6805 2283.03 1306.64 50.3031 1.16734 0.022209 0.00061461 1.11107e-  
 005 1.24249e-006 6.8538e-008 2.80537e-008 7.60681e-009 6.96396e-009 3.35039e-  
 009 2.62845e-009 9.11246e-009  
 1996 1 0.238244 1427.58 1691.33 154.827 20.4116 5.66926 1.72561 0.526108  
 0.149904 0.11645 0.0544138 0.0594316 0.0391605 0.0589826 0.033705 0.132182  
 1997 1 1.19043 257.8 1787.7 566.308 54.2442 9.47496 3.5613 1.29194 0.480505  
 0.146886 0.131687 0.0627187 0.0711827 0.0478894 0.0731399 0.23383  
 1998 1 0.417941 131.47 1276.47 1204.88 190.313 17.5173 3.03717 1.00603  
 0.349125 0.110868 0.0340804 0.0272976 0.0119289 0.0121753 0.00724813  
 0.0520169  
 1999 1 0.178767 85.5376 1119.21 842.86 318.382 51.762 5.70773 1.11766  
 0.470807 0.180681 0.0730689 0.0235867 0.0205877 0.00957281 0.0103428  
 0.0638162  
 2000 1 0.394708 162.854 1257.09 645.728 217.339 84.9839 15.7166 1.87345  
 0.431851 0.193642 0.0877995 0.0365662 0.0124922 0.0113414 0.00546332 0.050003  
 2001 1 10.0473 463.93 922.129 622.91 237.932 85.5338 37.9081 7.47625 1.00948  
 0.241708 0.122177 0.0561564 0.024206 0.0084408 0.00778964 0.0430565  
 2002 1 0.149612 361.936 1561.93 620.419 271.843 76.1493 21.3483 6.63503  
 1.06869 0.10723 0.023803 0.0100214 0.00396137 0.00144317 0.000418117  
 0.00277049  
 2003 1 0.742874 353.445 1363.81 718.026 292.636 165.711 64.7712 22.8615  
 10.2044 1.98094 0.276639 0.0676261 0.0326649 0.0144155 0.00584182 0.0170919  
 2004 1 0.24556 233.896 1806.03 916.417 384.941 152.678 90.0348 33.7069  
 12.7412 5.45105 1.17544 0.158543 0.0385904 0.018212 0.00778372 0.0144456  
 2005 1 3.64192 253.499 661.268 933.455 538.275 293.552 157.858 118.613  
 59.679 27.0763 14.7768 3.50704 0.532896 0.143504 0.0748545 0.109412  
 2006 1 1.05671 179.183 1279.36 533.63 299.574 131.494 61.6971 27.0279  
 18.0974 7.6572 3.34921 1.64167 0.357579 0.0492912 0.0119116 0.0163883  
 2007 1 0.7619 121.457 487.594 630.655 209.952 118.793 56.6517 26.5503  
 13.0339 8.66596 4.22205 1.82014 0.908344 0.197347 0.0269147 0.0184131  
 2008 1 13.8512 4.54306 173.867 384.921 470.95 172.364 112.074 56.6577  
 31.0168 15.8069 12.3757 6.09295 2.73483 1.39238 0.306424 0.083831  
 fleet 1 fleetarea 1 gmorph 2  
 Year Seas 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15  
 1975 E 106.725 62.9336 268.259 1296.1 1390.31 428.453 118.889 32.9868  
 9.57238 2.82019 0.852844 0.26444 0.0837862 0.0287444 0.00937463 0.00516988  
 1976 1 101.72 54.7598 273.127 757.779 895.863 249.029 50.7742 27.5008  
 8.02298 2.3742 0.720118 0.223725 0.0709679 0.024347 0.0079433 0.00438054  
 1977 1 66.5175 42.7648 144.961 775.58 529.693 199.13 53.0563 11.3745 6.60755  
 1.9784 0.605545 0.189114 0.060126 0.0206753 0.00673006 0.00371299  
 1978 1 49.0448 31.7321 126.093 457.309 628.312 145.2 53.0379 14.9198 3.42682  
 2.04041 0.630385 0.198102 0.0631023 0.0216712 0.00706665 0.00387603  
 1979 1 59.212 44.428 166.297 667.638 597.643 287.359 66.2613 26.1256 7.96076  
 1.89134 1.1712 0.374126 0.120748 0.0415278 0.0136169 0.00746033  
 1980 1 143.539 34.9951 138.078 477.418 442.498 128.294 63.6841 16.6766  
 7.37797 2.37365 0.598331 0.389859 0.130006 0.0458374 0.015119 0.00841659  
 1981 1 223.705 110.677 133.59 426.644 302.364 87.3988 26.6478 15.6217 4.7243  
 2.23884 0.775749 0.208572 0.143776 0.0528145 0.0179561 0.0101851

1982 1 689.726 1968.04 2671.42 328.351 82.1738 13.1132 3.27465 1.01962  
 0.64423 0.193044 0.0917359 0.0315983 0.00832467 0.00638265 0.00207261  
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 1983 1 724.964 6717.3 1861.85 441.46 50.4288 15.0512 2.80189 0.889405  
 0.342287 0.236465 0.0785458 0.0409535 0.0153574 0.00469525 0.00341523  
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 1984 1 525.525 3058.12 2299.56 714.388 204.07 29.7749 10.7106 2.44929  
 0.901923 0.368122 0.270016 0.0940347 0.0508215 0.0206355 0.00603715  
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 1985 1 346.034 1430.36 4211.74 666.399 118.286 32.1448 5.03307 2.0514  
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 1986 1 146.137 1805.21 2131.88 884.432 122.044 25.4877 8.17853 1.57862  
 0.758207 0.210196 0.0872924 0.0400318 0.0324588 0.0127891 0.0073414  
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 1987 1 147.463 1766.97 3473.24 479.816 119.439 18.3803 4.33689 1.63566  
 0.358166 0.181733 0.0534165 0.0233233 0.0111749 0.00971847 0.00374099  
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 1988 1 107.654 2977 4076.63 743.106 103.268 29.6565 5.26229 1.455 0.614257  
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 0.179615 0.0810137 0.0200666 0.0114215 0.00371254 0.00178369 0.000900564  
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 1990 1 5.2578 794.637 558.744 199.521 22.1956 1.81506 0.266108 0.100368  
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 1991 1 5.26972 749.697 1875.96 136.309 20.9281 1.01837 0.0311382 0.00215843  
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 1992 1 76.6516 2590.83 2885.81 277.36 9.02961 1.4484 0.0530285 0.00212668  
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 1993 1 103.313 1260.17 2164.39 222.088 15.261 0.780802 0.226547 0.0273643  
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 1994 1 81.6404 320.159 3631.84 394.207 16.7883 0.662458 0.0123835 0.00180859  
 0.000172047 1.26554e-005 1.63433e-006 4.82482e-007 8.10136e-008 4.38228e-008  
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 1995 1 19.6155 71.7815 2185.81 238.763 12.3346 0.775728 0.0270668  
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 1997 1 0.80048 54.9072 625.163 380.239 60.0119 5.9305 0.610414 0.0909979  
 0.0130452 0.001465 0.00100291 0.000239127 4.74608e-005 1.67391e-005 1.25951e-  
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 1998 1 0.393015 20.7223 311.476 632.295 186.612 16.7986 1.59991 0.167589  
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 1999 1 0.211742 10.183 233.557 423.551 317.563 43.2694 3.5412 0.346263  
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 2000 1 0.280002 29.0045 431.355 466.297 192.827 69.4169 8.96239 0.748624  
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 2003 1 0.440176 75.9438 602.765 556.018 205.375 104.806 34.2811 10.8633  
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 5.33542 2.02519 0.290338 0.0267231 0.00293442 0.000392185 6.80392e-005  
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 2005 1 2.72173 94.145 252.715 385.831 264.534 121.642 45.0167 25.0924  
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 2006 1 0.642943 49.2814 594.345 409.918 249.885 90.3238 32.2212 10.4403  
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 2008 1 18.5789 2.82494 16.1028 94.0249 265.997 91.946 51.3852 19.4824  
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 fleet 2 fleetarea 1 gmorph 1  
 Year Seas 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15  
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 1977 1 83.4744 1390.87 1330.35 597.227 65.9178 10.4349 1.50707 0.156513  
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 1978 1 84.1929 1401.75 1571.36 478.525 123.294 12.8533 2.38272 0.308036  
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 1980 1 300.963 1780.36 1835.7 518.416 104.475 21.1705 6.87488 0.816483  
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 1981 1 196.273 2338.27 664.216 156.82 25.8687 6.11428 1.68141 0.541534  
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 1982 1 581.383 1564.83 818.854 68.3009 7.72868 1.42987 0.449988 0.119737  
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 1983 1 269.407 1726.93 840.157 219.64 14.3449 1.67619 0.369801 0.10277  
 0.0383985 0.0177768 0.00520994 0.00212877 0.000672104 0.000166075 0.000107224  
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 1984 1 285.993 3286.71 1354.09 282.772 59.3573 4.11583 0.585114 0.116639  
 0.0462171 0.0164527 0.0124438 0.00348268 0.00149755 0.00046862 0.00011227  
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 1985 1 112.738 1395.12 1477.74 197.241 31.4699 7.25053 0.637019 0.084255  
 0.0246908 0.0094765 0.00560828 0.00407592 0.00120862 0.000517744 0.000157801  
 0.00031214



1986 1 71.0935 1532.3 637.202 191.212 20.2488 3.49443 1.00431 0.0812994  
0.0156619 0.0044304 0.00281296 0.00159917 0.00123063 0.000363602 0.000151808  
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1987 1 119.966 1355.47 669.495 66.2402 15.4695 1.75626 0.376034 0.0990593  
0.0116943 0.0021764 0.0010234 0.000625181 0.000377327 0.000290024 8.37383e-  
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1988 1 16.0865 1332 1051.83 180.788 13.8515 3.33906 0.458053 0.0888345  
0.0337893 0.00384351 0.00118453 0.000536137 0.000347794 0.000209865  
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1989 1 0.570691 40.2154 739.81 360.434 104.158 17.8539 9.28443 1.96952  
0.776261 0.393046 0.0871476 0.0304818 0.0170353 0.0128276 0.00882285  
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1990 1 0.58892 115.231 306.457 225.83 30.2132 9.7045 2.43958 1.45377  
0.444008 0.179017 0.134357 0.0292188 0.0108047 0.00606221 0.00449213  
0.0239862  
1991 1 0.572036 186.614 813.135 141.716 33.2334 4.75304 2.07452 0.559027  
0.453785 0.136648 0.079427 0.0575321 0.0130245 0.00477059 0.00260004 0.019696  
1992 1 0.20524 9.84721 498.495 295.538 27.2555 7.67219 1.47563 0.677475  
0.242692 0.191496 0.0819386 0.0456788 0.0342152 0.00763018 0.00270066  
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1993 1 2.75519 344.791 647.968 157.725 20.5419 2.30504 0.873313 0.175825  
0.107727 0.0374631 0.0420603 0.0172496 0.00994195 0.0073342 0.00158029  
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1994 1 1.96277 171.567 840.817 283.495 42.7382 6.14162 0.854404 0.318564  
0.0821489 0.0480665 0.0235646 0.0252824 0.0106965 0.00606354 0.00431794  
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1995 1 0.258602 80.0791 742.123 374.154 80.939 13.5271 2.37947 0.329877  
0.158583 0.0393038 0.0324779 0.0152439 0.0168913 0.0070346 0.00385173  
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1996 1 1.22896 296.169 957.79 195.755 27.2867 5.87205 1.2317 0.221599  
0.0407537 0.0190735 0.00674083 0.0053552 0.00260575 0.00285114 0.00115023  
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1997 1 0.0515811 15.451 335.856 167.585 14.4763 1.75183 0.421043 0.0842897  
0.0194339 0.00344943 0.00229917 0.000782631 0.000646316 0.000311493  
0.000331288 0.00105089  
1998 1 46.725 317.472 415.757 238.977 35.3067 2.5533 0.329526 0.0736652  
0.0186271 0.0041265 0.00104225 0.000668755 0.000236622 0.000193508 9.06238e-  
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1999 1 0.246822 44.6252 366 308.668 108.966 13.1281 0.995845 0.118029  
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2000 1 0.133449 10.8698 349.822 428.233 137.774 39.0111 4.76239 0.323011  
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2001 1 0.216359 41.1429 256.627 324.714 117.133 29.7067 8.44063 0.91235  
0.0756199 0.0103667 0.0038625 0.00125559 0.000389773 9.62766e-005 6.10863e-  
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2002 1 0.129302 36.1128 371.399 386.709 217.148 60.6691 15.0046 3.70109  
0.481839 0.0372843 0.00714087 0.00253532 0.000849109 0.000259163 6.18101e-005  
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2003 1 0.0622022 15.4191 283.197 379.174 157.137 68.9838 18.9385 4.08507  
1.21541 0.147843 0.0159677 0.00291435 0.00106572 0.000350848 0.00010337  
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2004 1 0.0861357 17.8132 382.696 500.469 224.203 72.4818 31.389 7.55358  
1.97493 0.550846 0.0937974 0.00966746 0.00181982 0.000654873 0.000208323  
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2005 1 0.0359762 23.0123 253.271 431.032 197.026 68.4088 21.7873 8.2727  
 2.41784 0.593838 0.232207 0.0377883 0.00402271 0.000746314 0.000259945  
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 2006 1 0.0301732 3.93107 292.448 356.369 206.685 72.3716 24.5947 6.84419  
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 2007 1 0.0175573 2.15046 89.9512 339.894 116.901 52.7653 18.2256 5.42589  
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 2008 1 39.959 190.371 273.241 141.639 77.8467 11.5524 3.27507 0.633116  
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 fleet 2 fleetarea 1 gmorph 2  
 Year Seas 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15  
 1975 E 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
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 1979 1 84.509 1152.58 1825.01 915.288 250.382 89.0136 13.7482 3.76802  
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 1980 1 228.736 1013.66 1691.91 730.78 206.988 44.3721 14.7533 2.68551  
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 1981 1 149.077 1340.64 684.536 273.101 59.1469 12.6409 2.5816 1.052 0.259429  
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 1982 1 528.536 1258.07 793.566 104.257 25.31 3.5966 0.714571 0.17637  
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 1984 1 234.908 2298.85 1328.65 314.277 70.8908 8.25212 2.04211 0.32894  
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 1985 1 80.8542 769.288 1507.58 257.071 41.4082 9.41236 1.06557 0.315961  
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 1986 1 49.6195 779.487 709.888 252.308 30.275 5.10949 1.12924 0.152122  
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1990 1 0.702815 16.2033 89.1744 158.735 42.0462 4.09193 0.633977 0.230094  
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 1991 1 0.425893 35.195 231.377 76.5137 49.0096 5.34284 0.485718 0.0825385  
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 1992 1 0.277161 0.465054 48.9342 68.7675 17.2617 7.03832 0.839118 0.0908093  
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 1993 1 1.7746 102.006 322.959 100.425 14.814 1.01689 0.398438 0.0578564  
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2.62197e-007 2.81779e-007 3.93537e-007 6.65825e-007  
1989 1 8.33204 9.45834 0.000814147 9.31799e-006 3.14601e-006 8.84878e-007  
8.33064e-007 3.86994e-007 2.85892e-007 2.95249e-007 9.65119e-008 5.24673e-008  
4.44093e-008 5.16658e-008 5.70076e-008 2.17587e-007  
1990 1 33.6364 55.056 0.000747644 1.32632e-005 2.07315e-006 1.09267e-006  
4.97281e-007 6.48934e-007 3.71491e-007 3.05493e-007 3.38024e-007 1.14254e-007  
6.39884e-008 5.54691e-008 6.59383e-008 3.55923e-007  
1991 1 18.6189 100.744 0.00312032 1.43569e-005 3.93375e-006 9.23185e-007  
7.29471e-007 4.30471e-007 6.54958e-007 4.02271e-007 3.44718e-007 3.88086e-007  
1.33063e-007 7.5301e-008 6.58377e-008 5.04174e-007  
1992 1 14.6604 79.2678 0.00220575 1.69021e-005 1.82081e-006 8.41039e-007  
2.92853e-007 2.94431e-007 1.97696e-007 3.18167e-007 2.00707e-007 1.73905e-007  
1.97285e-007 6.7974e-008 3.85961e-008 2.92595e-007  
1993 1 29.1578 214.693 0.00600967 4.74429e-005 7.21994e-006 1.3294e-006  
9.11848e-007 4.02024e-007 4.61689e-007 3.27476e-007 5.42037e-007 3.45508e-007  
3.01597e-007 3.4375e-007 1.18821e-007 5.7993e-007  
1994 1 152.944 144.169 0.00627316 5.93755e-005 1.04584e-005 2.4661e-006  
6.211e-007 5.07122e-007 2.45114e-007 2.92522e-007 2.11425e-007 3.52563e-007  
2.2591e-007 1.97858e-007 2.26031e-007 4.59994e-007  
1995 1 159.244 638.802 88.5079 0.274889 0.000104409 5.22461e-007 1.60043e-  
007 4.85293e-008 4.37046e-008 2.2084e-008 2.68989e-008 1.96197e-008 3.29214e-  
008 2.11806e-008 1.86024e-008 6.4568e-008  
1996 1 64.2078 556.93 121.255 0.231598 5.66901e-005 3.65286e-007 1.33431e-  
007 5.25069e-008 1.80898e-008 1.72611e-008 8.99197e-009 1.11011e-008  
8.17981e-009 1.38264e-008 8.94728e-009 3.5206e-008  
1997 1 17.1776 311.805 162.924 0.557308 8.45286e-005 3.06346e-007 1.28226e-  
007 5.61453e-008 2.425e-008 8.77536e-009 8.62167e-009 4.56063e-009 5.70336e-  
009 4.24632e-009 7.24413e-009 2.32298e-008  
1998 1 0.807271 374.704 230.721 1.89857 0.000492633 1.06696e-006 2.3981e-007  
1.17254e-007 5.55423e-008 2.50857e-008 9.3394e-009 9.31239e-009 4.98961e-009  
6.30364e-009 4.73531e-009 3.41874e-008  
1999 1 21.1234 313.855 244.721 1.76852 0.0010963 3.95755e-006 5.22789e-007  
1.35517e-007 7.12658e-008 3.51049e-008 1.62528e-008 6.12373e-009 6.1678e-009  
3.33037e-009 4.23505e-009 2.62441e-008  
2000 1 0.808523 367.093 344.935 2.74672 0.00155159 1.31577e-005 2.79735e-006  
4.14981e-007 1.13302e-007 6.13089e-008 3.07516e-008 1.43678e-008 5.45618e-009  
5.52956e-009 3.00192e-009 2.75641e-008  
2001 1 8.07592 680.85 342.263 4.02147 0.00254738 1.93486e-005 9.57414e-006  
2.26347e-006 3.51449e-007 9.82276e-008 5.39465e-008 2.72515e-008 1.28107e-008  
4.88832e-009 4.97505e-009 2.75728e-008

2002 1 27.4852 385.469 247.796 2.15855 0.0021284 1.78185e-005 7.67426e-006  
 4.1401e-006 1.00969e-006 1.59282e-007 4.49667e-008 2.48094e-008 1.25824e-008  
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 2003 1 20.095 476.954 255.918 2.45137 0.00178379 2.34595e-005 1.1216e-005  
 5.29136e-006 2.94916e-006 7.3137e-007 1.16434e-007 3.30236e-008 1.82869e-008  
 9.30025e-009 4.39525e-009 1.29122e-008  
 2004 1 32.9663 378.69 373.67 3.68332 0.00289739 2.80651e-005 2.11655e-005  
 1.11397e-005 5.45605e-006 3.10252e-006 7.78709e-007 1.24721e-007 3.55527e-008  
 1.97641e-008 1.00849e-008 1.88035e-008  
 2005 1 90.7806 608.919 202.321 2.62676 0.00210838 2.18976e-005 1.21373e-005  
 1.00785e-005 5.51821e-006 2.76329e-006 1.59276e-006 4.02803e-007 6.49359e-008  
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 2006 1 32.8579 258.241 281.951 2.10446 0.002143 2.24686e-005 1.32969e-005  
 8.09327e-006 6.97445e-006 3.8993e-006 1.98002e-006 1.14954e-006 2.92627e-007  
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 2007 1 63.0997 466.227 286.209 6.62424 0.00400021 5.4064e-005 3.25194e-005  
 2.11751e-005 1.33787e-005 1.17538e-005 6.64808e-006 3.39461e-006 1.97987e-006  
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 2008 1 380.152 298.419 0.032768 0.00145816 0.00191892 0.000838294 0.00066694  
 0.000437661 0.000294616 0.000189529 0.00016837 9.57879e-005 4.91526e-005  
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 fleet 6 fleetarea 1 gmorph 2  
 Year Seas 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15  
 1975 E 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
 1976 1 33.2819 599.454 2.15211 0.00202294 5.16666e-005 1.33679e-005  
 2.79039e-006 1.58716e-006 4.79241e-007 1.48268e-007 4.71361e-008 1.54124e-008  
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 1977 1 29.4064 632.536 1.54332 0.00279751 4.1276e-005 1.44428e-005 3.93971e-  
 006 8.86979e-007 5.3329e-007 1.66936e-007 5.35551e-008 1.7603e-008 5.94678e-  
 009 2.04746e-009 7.1195e-010 3.92784e-010  
 1978 1 30.5174 660.61 1.88949 0.00232168 6.89122e-005 1.48228e-005 5.5432e-  
 006 1.63754e-006 3.8928e-007 2.42327e-007 7.84708e-008 2.59537e-008 8.7844e-  
 009 3.02059e-009 1.05218e-009 5.77119e-010  
 1979 1 26.9542 676.652 1.82306 0.00247969 4.7954e-005 2.1461e-005 5.06638e-  
 006 2.09777e-006 6.61589e-007 1.6433e-007 1.06659e-007 3.58582e-008 1.22973e-  
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 1980 1 82.3248 671.523 1.90714 0.00223408 4.47342e-005 1.20719e-005  
 6.13499e-006 1.68712e-006 7.72529e-007 2.59841e-007 6.86517e-008 4.70787e-008  
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 1981 1 44.7759 741.17 0.643933 0.000696745 1.06676e-005 2.87001e-006  
 8.95884e-007 5.51535e-007 1.72633e-007 8.55308e-008 3.10627e-008 8.78983e-009  
 6.43828e-009 2.36798e-009 8.60014e-010 4.8782e-010  
 1982 1 98.1375 613.43 1.11923 0.000429858 7.37849e-006 1.31987e-006 4.0081e-  
 007 1.49454e-007 1.0454e-007 3.52331e-008 1.87851e-008 7.2791e-009 2.18825e-  
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 1983 1 87.6655 811.554 1.21768 0.000982812 7.64272e-006 2.45685e-006  
 5.13585e-007 1.79898e-007 7.3032e-008 5.35947e-008 1.88628e-008 1.04237e-008  
 4.16814e-009 1.27592e-009 9.91095e-010 5.97927e-010  
 1984 1 108.662 887.935 1.09884 0.000728074 1.16145e-005 1.70189e-006  
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 1985 1 22.2603 197.42 0.555379 0.000250822 2.85631e-006 8.17309e-007  
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 1986 1 91.8579 1314.8 1.56618 0.00145532 1.23454e-005 2.62282e-006 8.86007e-  
 007 1.80315e-007 8.93504e-008 2.57061e-008 1.10767e-008 5.27795e-009 4.4704e-  
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1987 1 59.4852 1190.01 1.75098 0.000756648 1.18611e-005 1.86923e-006  
4.64542e-007 1.83823e-007 4.13578e-008 2.16544e-008 6.56285e-009 2.95659e-009  
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1988 1 36.88 780.307 1.57507 0.00077571 6.64549e-006 1.92442e-006 3.52264e-  
007 1.00451e-007 4.31731e-008 1.02108e-008 5.59794e-009 1.76498e-009  
8.24669e-010 4.17359e-010 3.68825e-010 3.09291e-010  
1989 1 8.19198 98.5828 0.400378 0.000217027 1.55343e-006 2.39608e-007  
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1.46387e-010 7.03958e-011 3.72734e-011 6.20863e-011  
1990 1 38.3048 532.296 0.336595 0.000387257 2.79498e-006 2.40249e-007  
3.85586e-008 1.57872e-008 4.26837e-009 1.58853e-009 8.60199e-010 2.53196e-010  
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1991 1 10.6478 1064.95 1.17046 0.000293613 5.55586e-006 5.4111e-007  
5.09597e-008 9.76912e-009 4.72498e-009 1.43937e-009 6.06398e-010 3.68117e-010  
1.20894e-010 8.74057e-011 3.36862e-011 4.54081e-011  
1992 1 8.94671 840.058 0.985305 0.000304283 1.20638e-006 4.02383e-007  
4.96873e-008 6.06609e-009 1.39517e-009 7.61713e-010 2.62099e-010 1.23346e-010  
8.32129e-011 2.89871e-011 2.1877e-011 2.0833e-011  
1993 1 19.6278 2203.27 2.76294 0.000931405 4.86111e-006 3.05793e-007  
1.24127e-007 2.03335e-008 3.01475e-009 7.84149e-010 4.84459e-010 1.86205e-010  
9.71739e-011 7.02063e-011 2.5229e-011 3.94684e-011  
1994 1 183.706 1503.39 2.50306 0.00102274 6.68138e-006 6.34353e-007  
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6.39009e-011 3.49797e-011 2.59642e-011 2.49163e-011  
1995 1 132.725 489.495 193.098 16.1731 0.21433 0.0037955 1.55037e-005  
7.7944e-008 9.71834e-009 4.7773e-010 3.99747e-011 1.02285e-011 7.22632e-012  
3.13074e-012 1.77234e-012 2.67044e-012  
1996 1 52.724 398.101 219.149 16.9981 0.203541 0.00271737 1.35058e-005  
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1.49828e-012 6.62811e-013 9.96372e-013  
1997 1 12.3796 171.231 273.686 34.6535 0.378408 0.0047413 1.73418e-005  
1.42316e-007 4.29272e-009 1.15339e-010 3.80986e-011 7.73149e-012 1.55128e-012  
5.47576e-013 4.30253e-013 4.95106e-013  
1998 1 0.815497 82.6638 349.615 114.286 1.96646 0.0214959 7.32724e-005  
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9.6581e-013 3.45906e-013 6.01561e-013  
1999 1 28.1721 51.4712 353.777 92.6115 4.23991 0.0738148 0.000217734  
1.19661e-006 2.91512e-008 1.15825e-009 8.68312e-011 9.02707e-012 6.73551e-012  
1.79175e-012 3.84691e-013 3.88816e-013  
2000 1 0.921085 72.3648 491.192 127.948 5.03642 0.240688 0.00114007  
5.36378e-006 1.19705e-007 3.40399e-009 2.81638e-010 3.83243e-011 4.84812e-012  
3.807e-012 1.02144e-012 4.50355e-013  
2001 1 5.01931 269.856 475.754 179.408 7.18043 0.304899 0.00395014 2.97887e-  
005 5.66021e-007 1.46798e-008 8.66252e-010 1.2963e-010 2.13757e-011 2.84788e-  
012 2.24462e-012 8.8666e-013  
2002 1 36.0617 118.721 348.95 88.5191 5.44161 0.246615 0.00285642 5.83818e-  
005 1.76001e-006 3.86319e-008 2.0641e-009 2.18799e-010 3.94181e-011 6.79648e-  
012 9.09136e-013 1.01474e-012  
2003 1 20.4978 234.326 358.478 104.336 4.22998 0.292509 0.00362105 6.64563e-  
005 5.44082e-006 1.89771e-007 8.59554e-009 8.26158e-010 1.05589e-010 1.9905e-  
011 3.44855e-012 9.91381e-013  
2004 1 43.6091 99.6482 523.54 157.209 7.25 0.32563 0.00612946 0.000120002  
8.8116e-006 8.3535e-007 6.02008e-008 4.91222e-009 5.70147e-010 7.6326e-011  
1.44684e-011 3.28121e-012  
2005 1 86.1916 495.738 282.821 118.048 5.39782 0.274328 0.00332456 9.86435e-  
005 7.72026e-006 6.55086e-007 1.28054e-007 1.65964e-008 1.63314e-009  
1.98739e-010 2.67035e-011 6.31962e-012

2006 1 28.1488 179.091 387.198 90.3397 5.94455 0.291311 0.00395842 7.49534e-005 8.85345e-006 8.00278e-007 1.39971e-007 4.92257e-008 7.69643e-009 7.92562e-010 9.6971e-011 1.63705e-011  
2007 1 54.1085 325.238 392.773 275.752 10.2368 0.738033 0.00981765 0.000210896 1.59858e-005 2.18551e-006 4.08051e-007 1.2856e-007 5.45884e-008 8.94748e-009 9.25538e-010 1.34673e-010  
2008 1 429.155 2183.21 8.95761 0.0177205 0.00108302 0.000348447 0.000199367 7.938e-005 3.32434e-005 1.25672e-005 7.58846e-006 3.10164e-006 1.21501e-006 5.40144e-007 8.91096e-008 1.07301e-008

BIOLOGY 2 55 15 1 N\_Used\_morphs;\_lengths;\_ages;\_season;\_by\_season\_in\_endyr  
bin low Mean\_Size Wt\_len-F mat\_len spawn Wt\_len-M

1 25 25.5 0.12445 1 0.12445 0.12445  
2 26 26.5 0.14155 1 0.14155 0.14155  
3 27 27.5 0.160232 1 0.160232 0.160232  
4 28 28.5 0.180579 1 0.180579 0.180579  
5 29 29.5 0.202673 1 0.202673 0.202673  
6 30 30.5 0.226596 1 0.226596 0.226596  
7 31 31.5 0.252433 1 0.252433 0.252433  
8 32 32.5 0.280267 1 0.280267 0.280267  
9 33 33.5 0.310187 1 0.310187 0.310187  
10 34 34.5 0.342277 1 0.342277 0.342277  
11 35 35.5 0.376627 1 0.376627 0.376627  
12 36 36.5 0.413324 1 0.413324 0.413324  
13 37 37.5 0.452458 1 0.452458 0.452458  
14 38 38.5 0.494119 1 0.494119 0.494119  
15 39 39.5 0.538399 1 0.538399 0.538399  
16 40 40.5 0.58539 1 0.58539 0.58539  
17 41 41.5 0.635184 1 0.635184 0.635184  
18 42 42.5 0.687876 1 0.687876 0.687876  
19 43 43.5 0.743558 1 0.743558 0.743558  
20 44 44.5 0.802328 1 0.802328 0.802328  
21 45 45.5 0.86428 1 0.86428 0.86428  
22 46 46.5 0.929512 1 0.929512 0.929512  
23 47 47.5 0.99812 1 0.99812 0.99812  
24 48 48.5 1.0702 1 1.0702 1.0702  
25 49 49.5 1.14586 1 1.14586 1.14586  
26 50 50.5 1.22519 1 1.22519 1.22519  
27 51 51.5 1.3083 1 1.3083 1.3083  
28 52 52.5 1.39527 1 1.39527 1.39527  
29 53 53.5 1.48623 1 1.48623 1.48623  
30 54 54.5 1.58127 1 1.58127 1.58127  
31 55 55.5 1.68048 1 1.68048 1.68048  
32 56 56.5 1.78398 1 1.78398 1.78398  
33 57 57.5 1.89188 1 1.89188 1.89188  
34 58 58.5 2.00426 1 2.00426 2.00426  
35 59 59.5 2.12125 1 2.12125 2.12125  
36 60 60.5 2.24294 1 2.24294 2.24294  
37 61 61.5 2.36945 1 2.36945 2.36945  
38 62 62.5 2.50088 1 2.50088 2.50088  
39 63 63.5 2.63734 1 2.63734 2.63734  
40 64 64.5 2.77893 1 2.77893 2.77893  
41 65 65.5 2.92577 1 2.92577 2.92577  
42 66 66.5 3.07797 1 3.07797 3.07797  
43 67 67.5 3.23564 1 3.23564 3.23564  
44 68 68.5 3.39888 1 3.39888 3.39888  
45 69 69.5 3.56782 1 3.56782 3.56782



46 70 70.5 3.74255 1 3.74255 3.74255  
 47 71 71.5 3.9232 1 3.9232 3.9232  
 48 72 72.5 4.10988 1 4.10988 4.10988  
 49 73 73.5 4.30271 1 4.30271 4.30271  
 50 74 74.5 4.50178 1 4.50178 4.50178  
 51 75 75.5 4.70723 1 4.70723 4.70723  
 52 76 76.5 4.91917 1 4.91917 4.91917  
 53 77 77.5 5.13771 1 5.13771 5.13771  
 54 78 78.5 5.36296 1 5.36296 5.36296  
 55 79 79.5 5.59506 1 5.59506 5.59506

Growth\_Parameters

Count Yr Morph A1 A2 L-at-A1 L-at-A2 K A-at-L0 Linf CVmin CVmax natM\_amin  
 natM\_max M\_young M\_old  
 1 1976 1 0 0 0 0 0 0 0 0 0 0 2 0.287429 0.287429  
 2 1976 2 0 0 0 0 0 0 0 0 0 2 0.540621 0.540621  
 3 1976 1 0.5 6 29.61 62.12 0.200667 -1.86932 78.2523 0.001 0.001 0 2  
 0.287429 0.287429  
 4 1976 2 0.5 6 28.8967 53.195 0.213497 -2.30928 64.0635 0.001 0.001 0 2  
 0.540621 0.540621

Season gmorph GrowPattern Sex BirthSeas age age\_Beg age\_Mid M Len\_Beg Len\_Mid  
 SD\_Beg SD\_Mid Wt\_Beg Wt\_Mid Len\_Mat Age\_Mat Mat\*Fecund Len:\_1 SelWt:\_1  
 RetWt:\_1 Len:\_2 SelWt:\_2 RetWt:\_2 Len:\_3 SelWt:\_3 RetWt:\_3 Len:\_4 SelWt:\_4  
 RetWt:\_4 Len:\_5 SelWt:\_5 RetWt:\_5 Len:\_6 SelWt:\_6 RetWt:\_6 Len:\_7 SelWt:\_7  
 RetWt:\_7 Len:\_8 SelWt:\_8 RetWt:\_8 Len:\_9 SelWt:\_9 RetWt:\_9  
 1 1 1 1 1 0 0 0.5 0.287429 25 29.61 0.025 0.02961 0.12445 0.202673 1 0.38  
 0.0472911 29.5 0.202673 0.202673 29.5 0.202673 0.202673 29.5 0.202673  
 0.202673 29.5 0.202673 0.202673 29.5 0.202673 0.202673 29.5 0.202673 0.202673  
 29.5 0.202673 0.202673 29.5 0.202673 29.5 0.202673 29.5 0.202673  
 1 1 1 1 1 1 1.5 0.287429 34.2536 38.4539 0.0342536 0.0384539 0.342277  
 0.494119 1 0.91 0.311472 38.5 0.494119 0.494119 38.5 0.494119 0.494119 38.5  
 0.494119 0.494119 38.5 0.494119 0.494119 38.5 0.494119 0.494119 38.5 0.494119  
 0.494119 38.5 0.494119 0.494119 38.5 0.494119 0.494119 38.5 0.494119 0.494119  
 1 1 1 1 1 2 2 2.5 0.287429 42.2533 45.6899 0.0422533 0.0456899 0.687876  
 0.86428 1 0.98 0.674118 45.5 0.86428 0.86428 45.5 0.86428 0.86428 45.5  
 0.86428 0.86428 45.5 0.86428 0.86428 45.5 0.86428 0.86428 45.5 0.86428  
 0.86428 45.5 0.86428 0.86428 45.5 0.86428 0.86428 45.5 0.86428 0.86428  
 1 1 1 1 1 3 3 3.5 0.287429 48.7984 51.6102 0.0487984 0.0516102 1.0702 1.3083  
 1 1 1.0702 51.5 1.3083 1.3083 51.5 1.3083 1.3083 51.5 1.3083 1.3083 51.5  
 1.3083 1.3083 51.5 1.3083 1.3083 51.5 1.3083 1.3083 51.5 1.3083 1.3083 51.5  
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 1 1 1 1 1 4 4 4.5 0.287429 54.1536 56.4542 0.0541536 0.0564542 1.58105  
 1.78398 1 1 1.58105 56.5 1.78398 1.78398 56.5 1.78398 1.78398 56.5 1.78398  
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 1 1 1 1 1 5 5 5.5 0.287429 58.5351 60.4174 0.0585351 0.0604174 2.00426  
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 1 1 1 1 1 6 6 6.5 0.287429 62.12 63.6601 0.06212 0.0636601 2.49737 2.63734 1  
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 1 1 1 1 1 7 7 7.5 0.287429 65.0531 66.3132 0.0650531 0.0663132 2.89535  
 3.07797 1 1 2.89535 66.5 3.07797 3.07797 66.5 3.07797 3.07797 66.5 3.07797

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1 1 1 1 1 8 8 8.5 0.287429 67.4529 68.4839 0.0674529 0.0684839 3.23564  
3.39888 1 1 3.23564 68.5 3.39888 3.39888 68.5 3.39888 3.39888 68.5 3.39888  
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1 1 1 1 1 9 9 9.5 0.287429 69.4164 70.2599 0.0694164 0.0702599 3.56782  
3.74253 1 1 3.56782 70.4999 3.74253 3.74253 70.4998 3.74252 3.74252 70.4999  
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1 1 1 1 1 10 10 10.5 0.287429 71.0229 71.7131 0.0710229 0.0717131 3.85572  
3.92321 1 1 3.85572 71.5 3.92321 3.92321 71.5 3.92321 3.92321 71.5 3.92321  
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1 1 1 1 1 11 11 11.5 0.287429 72.3373 72.902 0.0723373 0.072902 4.10988  
4.12712 1 1 4.10988 72.5787 4.12505 4.12505 72.5523 4.11996 4.11996 72.5888  
4.127 4.127 72.5893 4.1271 4.1271 72.5595 4.12136 4.12136 72.5894 4.12712  
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1 1 1 1 1 12 12 12.5 0.287429 73.4127 73.8747 0.0734127 0.0738747 4.30271  
4.31166 1 1 4.30271 73.5391 4.31049 4.31049 73.5253 4.30773 4.30773 73.5449  
4.31164 4.31164 73.5449 4.31165 4.31165 73.529 4.30849 4.30849 73.545 4.31166  
4.31166 73.545 4.31166 4.31166 73.545 4.31166 4.31166 73.545 4.31166 4.31166  
1 1 1 1 1 13 13 13.5 0.287429 74.2926 74.6707 0.0742926 0.0746707 4.50177  
4.50178 1 1 4.50177 74.5 4.50178 4.50178 74.5 4.50178 4.50178 74.5 4.50178  
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1 1 1 1 1 14 14 14.5 0.287429 75.0126 75.3218 0.0750126 0.0753218 4.61818  
4.70723 1 1 4.61818 75.5 4.70723 4.70723 75.5 4.70723 4.70723 75.5 4.70723  
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1 1 1 1 1 15 15 15.5 0.287429 75.6016 75.8546 0.0756016 0.0758546 4.70723  
4.7131 1 1 4.70723 75.5237 4.71225 4.71225 75.5148 4.71036 4.71036 75.5277  
4.71309 4.71309 75.5276 4.71309 4.71309 75.5172 4.71088 4.71088 75.5277  
4.71309 4.71309 75.5277 4.7131 4.7131 75.5277 4.7131 4.7131 75.5277 4.7131  
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1 2 1 2 1 0 0 0.5 0.540621 25 28.8967 0.025 0.0288967 0.12445 0.180583 1 -1 0  
28.5002 0.180583 0.180583 28.5003 0.180586 0.180586 28.5004 0.180588 0.180588  
28.5002 0.180583 0.180583 28.5003 0.180585 0.180585 28.5002 0.180584 0.180584  
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1 2 1 2 1 1 1 1.5 0.540621 32.4573 35.6573 0.0324573 0.0356573 0.280267  
0.376627 1 -1 0 35.5 0.376627 0.376627 35.5 0.376627 0.376627 35.5 0.376627  
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1 2 1 2 1 2 2 2.5 0.540621 38.5334 41.1183 0.0385334 0.0411183 0.494119  
0.635084 1 -1 0 41.4989 0.635132 0.635132 41.4982 0.635095 0.635095 41.4975  
0.635058 0.635058 41.4981 0.635088 0.635088 41.4981 0.635091 0.635091 41.4936  
0.634866 0.634866 41.498 0.635084 0.635084 41.498 0.635084 0.635084 41.498  
0.635084 0.635084  
1 2 1 2 1 3 3 3.5 0.540621 43.4414 45.5294 0.0434414 0.0455294 0.743558  
0.86428 1 -1 0 45.5 0.86428 0.86428 45.5 0.86428 0.86428 45.5 0.86428 0.86428  
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1 2 1 2 1 4 4 4.5 0.540621 47.4059 49.0925 0.0474059 0.0490925 0.99812  
1.14361 1 -1 0 49.474 1.14389 1.14389 49.4681 1.14345 1.14345 49.4559 1.14253

1.14253 49.4702 1.14361 1.14361 49.4678 1.14342 1.14342 49.4687 1.14349  
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1 2 1 2 1 5 5 5.5 0.540621 50.6083 51.9706 0.0506083 0.0519706 1.22519  
1.33315 1 -1 0 51.7853 1.33312 1.33312 51.7594 1.33086 1.33086 51.6996  
1.32565 1.32565 51.7858 1.33315 1.33315 51.7608 1.33098 1.33098 51.7856  
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1 2 1 2 1 6 6 6.5 0.540621 53.195 54.2954 0.053195 0.0542954 1.48622 1.58127  
1 -1 0 54.5 1.58127 1.58127 54.5 1.58127 1.58127 54.5 1.58127 1.58127 54.5  
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1 2 1 2 1 7 7 7.5 0.540621 55.2844 56.1733 0.0552844 0.0561733 1.68048  
1.78388 1 -1 0 56.499 1.78388 1.78388 56.4987 1.78385 1.78385 56.4982 1.7838  
1.7838 56.4894 1.78289 1.78289 56.4988 1.78386 1.78386 56.499 1.78388 1.78388  
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1 2 1 2 1 8 8 8.5 0.540621 56.9722 57.6901 0.0569722 0.0576901 1.8177 1.89188  
1 -1 0 57.5 1.89188 1.89188 57.5 1.89188 1.89188 57.5 1.89188 1.89188 57.5  
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1 2 1 2 1 9 9 9.5 0.540621 58.3354 58.9154 0.0583354 0.0589154 2.00426  
2.01309 1 -1 0 58.5722 2.01271 2.01271 58.5581 2.01106 2.01106 58.5418  
2.00915 2.00915 58.5292 2.00768 2.00768 58.5609 2.01139 2.01139 58.5755  
2.01309 2.01309 58.5755 2.01309 2.01309 58.5755 2.01309 2.01309 58.5755  
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1 2 1 2 1 10 10 10.5 0.540621 59.4366 59.9051 0.0594366 0.0599051 2.12125  
2.12813 1 -1 0 59.5537 2.12779 2.12779 59.5425 2.12642 2.12642 59.5304  
2.12495 2.12495 59.5413 2.12627 2.12627 59.5448 2.1267 2.1267 59.5566 2.12813  
2.12813 59.5566 2.12813 2.12813 59.5566 2.12813 2.12813 59.5566 2.12813  
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1 2 1 2 1 11 11 11.5 0.540621 60.3261 60.7045 0.0603261 0.0607045 2.24294  
2.24294 1 -1 0 60.5 2.24294 2.24294 60.5 2.24294 2.24294 60.5 2.24294 2.24294  
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1 2 1 2 1 12 12 12.5 0.540621 61.0446 61.3503 0.0610446 0.0613503 2.34005  
2.36945 1 -1 0 61.5 2.36945 2.36945 61.5 2.36945 2.36945 61.5 2.36945 2.36945  
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1 2 1 2 1 13 13 13.5 0.540621 61.625 61.8719 0.061625 0.0618719 2.36945  
2.37197 1 -1 0 61.518 2.37181 2.37181 61.5137 2.37125 2.37125 61.5098 2.37074  
2.37074 61.5182 2.37184 2.37184 61.5147 2.37138 2.37138 61.5192 2.37197  
2.37197 61.5192 2.37197 2.37197 61.5192 2.37197 2.37197 61.5192 2.37197  
2.37197  
1 2 1 2 1 14 14 14.5 0.540621 62.0938 62.2932 0.0620938 0.0622932 2.49228  
2.50088 1 -1 0 62.5 2.50088 2.50088 62.5 2.50088 2.50088 62.5 2.50088 2.50088  
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1 2 1 2 1 15 15 15.5 0.540621 62.4725 62.6336 0.0624725 0.0626336 2.50088  
2.50088 1 -1 0 62.5 2.50088 2.50088 62.5 2.50088 2.50088 62.5 2.50088 2.50088  
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MEAN\_BODY\_WT(begin)

morph year season 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15  
1 1976 1 0.12445 0.342277 0.687876 1.0702 1.58105 2.00426 2.49737 2.89535  
3.23564 3.56782 3.85572 4.10988 4.30271 4.50177 4.61818 4.70723





2 1999 1 0.12445 0.280267 0.494119 0.743558 0.99812 1.22519 1.48622 1.68048  
1.8177 2.00426 2.12125 2.24294 2.34005 2.36945 2.49228 2.50088  
2 2000 1 0.12445 0.280267 0.494119 0.743558 0.99812 1.22519 1.48622 1.68048  
1.8177 2.00426 2.12125 2.24294 2.34005 2.36945 2.49228 2.50088  
2 2001 1 0.12445 0.280267 0.494119 0.743558 0.99812 1.22519 1.48622 1.68048  
1.8177 2.00426 2.12125 2.24294 2.34005 2.36945 2.49228 2.50088  
2 2002 1 0.12445 0.280267 0.494119 0.743558 0.99812 1.22519 1.48622 1.68048  
1.8177 2.00426 2.12125 2.24294 2.34005 2.36945 2.49228 2.50088  
2 2003 1 0.12445 0.280267 0.494119 0.743558 0.99812 1.22519 1.48622 1.68048  
1.8177 2.00426 2.12125 2.24294 2.34005 2.36945 2.49228 2.50088  
2 2004 1 0.12445 0.280267 0.494119 0.743558 0.99812 1.22519 1.48622 1.68048  
1.8177 2.00426 2.12125 2.24294 2.34005 2.36945 2.49228 2.50088  
2 2005 1 0.12445 0.280267 0.494119 0.743558 0.99812 1.22519 1.48622 1.68048  
1.8177 2.00426 2.12125 2.24294 2.34005 2.36945 2.49228 2.50088  
2 2006 1 0.12445 0.280267 0.494119 0.743558 0.99812 1.22519 1.48622 1.68048  
1.8177 2.00426 2.12125 2.24294 2.34005 2.36945 2.49228 2.50088  
2 2007 1 0.12445 0.280267 0.494119 0.743558 0.99812 1.22519 1.48622 1.68048  
1.8177 2.00426 2.12125 2.24294 2.34005 2.36945 2.49228 2.50088  
2 2008 1 0.12445 0.280267 0.494119 0.743558 0.99812 1.22519 1.48622 1.68048  
1.8177 2.00426 2.12125 2.24294 2.34005 2.36945 2.49228 2.50088  
2 2009 1 0.12445 0.280267 0.494119 0.743558 0.99812 1.22519 1.48622 1.68048  
1.8177 2.00426 2.12125 2.24294 2.34005 2.36945 2.49228 2.50088

MEAN\_SIZE\_TIMESERIES

morph year season beg/mid 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15  
1 1976 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 1976 1 1 29.61 38.4539 45.6899 51.6102 56.4542 60.4174 63.6601 66.3132  
68.4839 70.2599 71.7131 72.902 73.8747 74.6707 75.3218 75.8546  
1 1977 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 1977 1 1 29.61 38.4539 45.6899 51.6102 56.4542 60.4174 63.6601 66.3132  
68.4839 70.2599 71.7131 72.902 73.8747 74.6707 75.3218 75.8546  
1 1978 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 1978 1 1 29.61 38.4539 45.6899 51.6102 56.4542 60.4174 63.6601 66.3132  
68.4839 70.2599 71.7131 72.902 73.8747 74.6707 75.3218 75.8546  
1 1979 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 1979 1 1 29.61 38.4539 45.6899 51.6102 56.4542 60.4174 63.6601 66.3132  
68.4839 70.2599 71.7131 72.902 73.8747 74.6707 75.3218 75.8546  
1 1980 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 1980 1 1 29.61 38.4539 45.6899 51.6102 56.4542 60.4174 63.6601 66.3132  
68.4839 70.2599 71.7131 72.902 73.8747 74.6707 75.3218 75.8546  
1 1981 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 1981 1 1 29.61 38.4539 45.6899 51.6102 56.4542 60.4174 63.6601 66.3132  
68.4839 70.2599 71.7131 72.902 73.8747 74.6707 75.3218 75.8546  
1 1982 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 1982 1 1 29.61 38.4539 45.6899 51.6102 56.4542 60.4174 63.6601 66.3132  
68.4839 70.2599 71.7131 72.902 73.8747 74.6707 75.3218 75.8546  
1 1983 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 1983 1 1 29.61 38.4539 45.6899 51.6102 56.4542 60.4174 63.6601 66.3132  
68.4839 70.2599 71.7131 72.902 73.8747 74.6707 75.3218 75.8546



1 1998 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 1998 1 1 29.61 38.4539 45.6899 51.6102 56.4542 60.4174 63.6601 66.3132  
68.4839 70.2599 71.7131 72.902 73.8747 74.6707 75.3218 75.8546  
1 1999 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 1999 1 1 29.61 38.4539 45.6899 51.6102 56.4542 60.4174 63.6601 66.3132  
68.4839 70.2599 71.7131 72.902 73.8747 74.6707 75.3218 75.8546  
1 2000 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 2000 1 1 29.61 38.4539 45.6899 51.6102 56.4542 60.4174 63.6601 66.3132  
68.4839 70.2599 71.7131 72.902 73.8747 74.6707 75.3218 75.8546  
1 2001 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 2001 1 1 29.61 38.4539 45.6899 51.6102 56.4542 60.4174 63.6601 66.3132  
68.4839 70.2599 71.7131 72.902 73.8747 74.6707 75.3218 75.8546  
1 2002 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 2002 1 1 29.61 38.4539 45.6899 51.6102 56.4542 60.4174 63.6601 66.3132  
68.4839 70.2599 71.7131 72.902 73.8747 74.6707 75.3218 75.8546  
1 2003 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 2003 1 1 29.61 38.4539 45.6899 51.6102 56.4542 60.4174 63.6601 66.3132  
68.4839 70.2599 71.7131 72.902 73.8747 74.6707 75.3218 75.8546  
1 2004 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 2004 1 1 29.61 38.4539 45.6899 51.6102 56.4542 60.4174 63.6601 66.3132  
68.4839 70.2599 71.7131 72.902 73.8747 74.6707 75.3218 75.8546  
1 2005 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 2005 1 1 29.61 38.4539 45.6899 51.6102 56.4542 60.4174 63.6601 66.3132  
68.4839 70.2599 71.7131 72.902 73.8747 74.6707 75.3218 75.8546  
1 2006 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 2006 1 1 29.61 38.4539 45.6899 51.6102 56.4542 60.4174 63.6601 66.3132  
68.4839 70.2599 71.7131 72.902 73.8747 74.6707 75.3218 75.8546  
1 2007 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 2007 1 1 29.61 38.4539 45.6899 51.6102 56.4542 60.4174 63.6601 66.3132  
68.4839 70.2599 71.7131 72.902 73.8747 74.6707 75.3218 75.8546  
1 2008 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 2008 1 1 29.61 38.4539 45.6899 51.6102 56.4542 60.4174 63.6601 66.3132  
68.4839 70.2599 71.7131 72.902 73.8747 74.6707 75.3218 75.8546  
1 2009 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 2009 1 1 29.61 38.4539 45.6899 51.6102 56.4542 60.4174 63.6601 66.3132  
68.4839 70.2599 71.7131 72.902 73.8747 74.6707 75.3218 75.8546  
2 1976 1 0 25 32.4573 38.5334 43.4414 47.4059 50.6083 53.195 55.2844 56.9722  
58.3354 59.4366 60.3261 61.0446 61.625 62.0938 62.4725  
2 1976 1 1 28.8967 35.6573 41.1183 45.5294 49.0925 51.9706 54.2954 56.1733  
57.6901 58.9154 59.9051 60.7045 61.3503 61.8719 62.2932 62.6336  
2 1977 1 0 25 32.4573 38.5334 43.4414 47.4059 50.6083 53.195 55.2844 56.9722  
58.3354 59.4366 60.3261 61.0446 61.625 62.0938 62.4725  
2 1977 1 1 28.8967 35.6573 41.1183 45.5294 49.0925 51.9706 54.2954 56.1733  
57.6901 58.9154 59.9051 60.7045 61.3503 61.8719 62.2932 62.6336







2 2006 1 0 25 32.4573 38.5334 43.4414 47.4059 50.6083 53.195 55.2844 56.9722  
58.3354 59.4366 60.3261 61.0446 61.625 62.0938 62.4725  
2 2006 1 1 28.8967 35.6573 41.1183 45.5294 49.0925 51.9706 54.2954 56.1733  
57.6901 58.9154 59.9051 60.7045 61.3503 61.8719 62.2932 62.6336  
2 2007 1 0 25 32.4573 38.5334 43.4414 47.4059 50.6083 53.195 55.2844 56.9722  
58.3354 59.4366 60.3261 61.0446 61.625 62.0938 62.4725  
2 2007 1 1 28.8967 35.6573 41.1183 45.5294 49.0925 51.9706 54.2954 56.1733  
57.6901 58.9154 59.9051 60.7045 61.3503 61.8719 62.2932 62.6336  
2 2008 1 0 25 32.4573 38.5334 43.4414 47.4059 50.6083 53.195 55.2844 56.9722  
58.3354 59.4366 60.3261 61.0446 61.625 62.0938 62.4725  
2 2008 1 1 28.8967 35.6573 41.1183 45.5294 49.0925 51.9706 54.2954 56.1733  
57.6901 58.9154 59.9051 60.7045 61.3503 61.8719 62.2932 62.6336  
2 2009 1 0 25 32.4573 38.5334 43.4414 47.4059 50.6083 53.195 55.2844 56.9722  
58.3354 59.4366 60.3261 61.0446 61.625 62.0938 62.4725  
2 2009 1 1 28.8967 35.6573 41.1183 45.5294 49.0925 51.9706 54.2954 56.1733  
57.6901 58.9154 59.9051 60.7045 61.3503 61.8719 62.2932 62.6336

mean\_size\_Jan\_1\_for\_gender: 1

1 1976 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 1977 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 1978 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 1979 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 1980 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 1981 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 1982 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 1983 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 1984 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 1985 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 1986 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 1987 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 1988 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 1989 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 1990 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 1991 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 1992 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 1993 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 1994 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016

1 1995 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 1996 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 1997 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 1998 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 1999 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 2000 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 2001 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 2002 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 2003 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 2004 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 2005 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 2006 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 2007 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 2008 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016  
1 2009 1 0 25 34.2536 42.2533 48.7984 54.1536 58.5351 62.12 65.0531 67.4529  
69.4164 71.0229 72.3373 73.4127 74.2926 75.0126 75.6016

mean\_size\_Jan\_1\_for\_gender: 2

2 1976 1 0 25 32.4573 38.5334 43.4414 47.4059 50.6083 53.195 55.2844 56.9722  
58.3354 59.4366 60.3261 61.0446 61.625 62.0938 62.4725  
2 1977 1 0 25 32.4573 38.5334 43.4414 47.4059 50.6083 53.195 55.2844 56.9722  
58.3354 59.4366 60.3261 61.0446 61.625 62.0938 62.4725  
2 1978 1 0 25 32.4573 38.5334 43.4414 47.4059 50.6083 53.195 55.2844 56.9722  
58.3354 59.4366 60.3261 61.0446 61.625 62.0938 62.4725  
2 1979 1 0 25 32.4573 38.5334 43.4414 47.4059 50.6083 53.195 55.2844 56.9722  
58.3354 59.4366 60.3261 61.0446 61.625 62.0938 62.4725  
2 1980 1 0 25 32.4573 38.5334 43.4414 47.4059 50.6083 53.195 55.2844 56.9722  
58.3354 59.4366 60.3261 61.0446 61.625 62.0938 62.4725  
2 1981 1 0 25 32.4573 38.5334 43.4414 47.4059 50.6083 53.195 55.2844 56.9722  
58.3354 59.4366 60.3261 61.0446 61.625 62.0938 62.4725  
2 1982 1 0 25 32.4573 38.5334 43.4414 47.4059 50.6083 53.195 55.2844 56.9722  
58.3354 59.4366 60.3261 61.0446 61.625 62.0938 62.4725  
2 1983 1 0 25 32.4573 38.5334 43.4414 47.4059 50.6083 53.195 55.2844 56.9722  
58.3354 59.4366 60.3261 61.0446 61.625 62.0938 62.4725  
2 1984 1 0 25 32.4573 38.5334 43.4414 47.4059 50.6083 53.195 55.2844 56.9722  
58.3354 59.4366 60.3261 61.0446 61.625 62.0938 62.4725  
2 1985 1 0 25 32.4573 38.5334 43.4414 47.4059 50.6083 53.195 55.2844 56.9722  
58.3354 59.4366 60.3261 61.0446 61.625 62.0938 62.4725  
2 1986 1 0 25 32.4573 38.5334 43.4414 47.4059 50.6083 53.195 55.2844 56.9722  
58.3354 59.4366 60.3261 61.0446 61.625 62.0938 62.4725  
2 1987 1 0 25 32.4573 38.5334 43.4414 47.4059 50.6083 53.195 55.2844 56.9722  
58.3354 59.4366 60.3261 61.0446 61.625 62.0938 62.4725

2 1988 1 0 25 32.4573 38.5334 43.4414 47.4059 50.6083 53.195 55.2844 56.9722  
58.3354 59.4366 60.3261 61.0446 61.625 62.0938 62.4725  
2 1989 1 0 25 32.4573 38.5334 43.4414 47.4059 50.6083 53.195 55.2844 56.9722  
58.3354 59.4366 60.3261 61.0446 61.625 62.0938 62.4725  
2 1990 1 0 25 32.4573 38.5334 43.4414 47.4059 50.6083 53.195 55.2844 56.9722  
58.3354 59.4366 60.3261 61.0446 61.625 62.0938 62.4725  
2 1991 1 0 25 32.4573 38.5334 43.4414 47.4059 50.6083 53.195 55.2844 56.9722  
58.3354 59.4366 60.3261 61.0446 61.625 62.0938 62.4725  
2 1992 1 0 25 32.4573 38.5334 43.4414 47.4059 50.6083 53.195 55.2844 56.9722  
58.3354 59.4366 60.3261 61.0446 61.625 62.0938 62.4725  
2 1993 1 0 25 32.4573 38.5334 43.4414 47.4059 50.6083 53.195 55.2844 56.9722  
58.3354 59.4366 60.3261 61.0446 61.625 62.0938 62.4725  
2 1994 1 0 25 32.4573 38.5334 43.4414 47.4059 50.6083 53.195 55.2844 56.9722  
58.3354 59.4366 60.3261 61.0446 61.625 62.0938 62.4725  
2 1995 1 0 25 32.4573 38.5334 43.4414 47.4059 50.6083 53.195 55.2844 56.9722  
58.3354 59.4366 60.3261 61.0446 61.625 62.0938 62.4725  
2 1996 1 0 25 32.4573 38.5334 43.4414 47.4059 50.6083 53.195 55.2844 56.9722  
58.3354 59.4366 60.3261 61.0446 61.625 62.0938 62.4725  
2 1997 1 0 25 32.4573 38.5334 43.4414 47.4059 50.6083 53.195 55.2844 56.9722  
58.3354 59.4366 60.3261 61.0446 61.625 62.0938 62.4725  
2 1998 1 0 25 32.4573 38.5334 43.4414 47.4059 50.6083 53.195 55.2844 56.9722  
58.3354 59.4366 60.3261 61.0446 61.625 62.0938 62.4725  
2 1999 1 0 25 32.4573 38.5334 43.4414 47.4059 50.6083 53.195 55.2844 56.9722  
58.3354 59.4366 60.3261 61.0446 61.625 62.0938 62.4725  
2 2000 1 0 25 32.4573 38.5334 43.4414 47.4059 50.6083 53.195 55.2844 56.9722  
58.3354 59.4366 60.3261 61.0446 61.625 62.0938 62.4725  
2 2001 1 0 25 32.4573 38.5334 43.4414 47.4059 50.6083 53.195 55.2844 56.9722  
58.3354 59.4366 60.3261 61.0446 61.625 62.0938 62.4725  
2 2002 1 0 25 32.4573 38.5334 43.4414 47.4059 50.6083 53.195 55.2844 56.9722  
58.3354 59.4366 60.3261 61.0446 61.625 62.0938 62.4725  
2 2003 1 0 25 32.4573 38.5334 43.4414 47.4059 50.6083 53.195 55.2844 56.9722  
58.3354 59.4366 60.3261 61.0446 61.625 62.0938 62.4725  
2 2004 1 0 25 32.4573 38.5334 43.4414 47.4059 50.6083 53.195 55.2844 56.9722  
58.3354 59.4366 60.3261 61.0446 61.625 62.0938 62.4725  
2 2005 1 0 25 32.4573 38.5334 43.4414 47.4059 50.6083 53.195 55.2844 56.9722  
58.3354 59.4366 60.3261 61.0446 61.625 62.0938 62.4725  
2 2006 1 0 25 32.4573 38.5334 43.4414 47.4059 50.6083 53.195 55.2844 56.9722  
58.3354 59.4366 60.3261 61.0446 61.625 62.0938 62.4725  
2 2007 1 0 25 32.4573 38.5334 43.4414 47.4059 50.6083 53.195 55.2844 56.9722  
58.3354 59.4366 60.3261 61.0446 61.625 62.0938 62.4725  
2 2008 1 0 25 32.4573 38.5334 43.4414 47.4059 50.6083 53.195 55.2844 56.9722  
58.3354 59.4366 60.3261 61.0446 61.625 62.0938 62.4725  
2 2009 1 0 25 32.4573 38.5334 43.4414 47.4059 50.6083 53.195 55.2844 56.9722  
58.3354 59.4366 60.3261 61.0446 61.625 62.0938 62.4725

AGE\_LENGTH\_KEY  
sdratio 1000  
sdwithin 1  
sdbetween 1e-006

SEASON: 1 MORPH: 1  
Age: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15  
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78 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
77 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  
76 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0.0276667  
75 0 0 0 0 0 0 0 0 0 0 0 0 0 5.15664e-006 0.99999 0.972333

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73 0 0 0 0 0 0 0 0 0 0 0 0.0893952 0.955004 1.35546e-019 3.20638e-069
2.78116e-132
72 0 0 0 0 0 0 0 0 0 0 3.15074e-005 0.910605 1.23412e-032 3.8891e-111
6.73625e-209 3.5943e-310
71 0 0 0 0 0 0 0 0 0 0 0.999968 1.90069e-035 2.4841e-142 2.17405e-280 0 0
70 0 0 0 0 0 0 0 0 0 0.999892 1.37735e-023 2.66169e-150 0 0 0 0
69 0 0 0 0 0 0 0 0 2.43139e-014 0.0001081 2.27033e-126 0 0 0 0 0
68 0 0 0 0 0 0 0 0 1 3.52652e-072 1.96337e-313 0 0 0 0 0
67 0 0 0 0 0 0 0 0 0 8.05867e-013 3.09817e-227 0 0 0 0 0 0
66 0 0 0 0 0 0 0 0 0.999999 2.26793e-104 0 0 0 0 0 0 0
65 0 0 0 0 0 0 0 1.1673e-006 2.84184e-288 0 0 0 0 0 0 0
64 0 0 0 0 0 4.65912e-008 1.53469e-087 0 0 0 0 0 0 0 0
63 0 0 0 0 0 1 7.95851e-267 0 0 0 0 0 0 0 0
62 0 0 0 0 0 1.76185e-025 0 0 0 0 0 0 0 0
61 0 0 0 0 0 3.70519e-150 0 0 0 0 0 0 0 0
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59 0 0 0 0 2.46157e-012 0 0 0 0 0 0 0 0 0 0
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39 0 0 0 0 0 0 0 0 0 0 0 0 0 0
38 0 1 0 0 0 0 0 0 0 0 0 0 0 0
37 0 1.90961e-032 0 0 0 0 0 0 0 0 0 0 0 0
36 0 4.61743e-313 0 0 0 0 0 0 0 0 0 0 0 0
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32 0 0 0 0 0 0 0 0 0 0 0 0 0 0
31 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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29 1 0 0 0 0 0 0 0 0 0 0 0 0 0
28 1.45166e-094 0 0 0 0 0 0 0 0 0 0 0 0 0
27 0 0 0 0 0 0 0 0 0 0 0 0 0 0
26 0 0 0 0 0 0 0 0 0 0 0 0 0 0
25 0 0 0 0 0 0 0 0 0 0 0 0 0 0
mean 29.61 38.4539 45.6899 51.6102 56.4542 60.4174 63.6601 66.3132 68.4839
70.2599 71.7131 72.902 73.8747 74.6707 75.3218 75.8546
sdszize 0.02961 0.0384539 0.0456899 0.0516102 0.0564542 0.0604174 0.0636601
0.0663132 0.0684839 0.0702599 0.0717131 0.072902 0.0738747 0.0746707
0.0753218 0.0758546

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SEASON: 1 MORPH: 2
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78 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
77 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
76 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
75 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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66 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
65 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
64 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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62 0 0 0 0 0 0 0 0 0 0 0 0 0 0.0192031 0.999999 1
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096 3.31475e-150
59 0 0 0 0 0 0 0 0 0 0.075493 0.943426 1.9761e-031 1.27542e-107 2.58835e-201
6.52616e-297 0
58 0 0 0 0 0 0 0 0 3.92182e-008 0.924507 7.43177e-052 9.86104e-174 2.49503e-
321 0 0 0
57 0 0 0 0 0 0 0 1 1.0189e-054 3.46612e-222 0 0 0 0 0
56 0 0 0 0 0 0 0.998981 2.86503e-033 4.26688e-232 0 0 0 0 0
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58.9154 59.9051 60.7045 61.3503 61.8719 62.2932 62.6336
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AGE\_AGE\_KEY

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Composition\_Database

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9 1976 A 1 1 0.131928  
9 1976 A 1 2 0.679718  
9 1976 A 1 3 0.99919  
9 1976 A 1 4 0.997754  
9 1976 A 1 5 0.927575  
9 1976 A 1 6 0.77851  
9 1976 A 1 7 0.589854  
9 1976 A 1 8 0.403451  
9 1976 A 1 9 0.249116  
9 1976 A 1 10 0.13886  
9 1976 A 1 11 0.0698746

9 1976 A 1 12 0.0317414  
9 1976 A 1 13 0.0130166  
9 1976 A 1 14 0.00481877  
9 1976 A 1 15 0.00161042  
9 1976 A 2 0 7.11512e-007  
9 1976 A 2 1 0.131928  
9 1976 A 2 2 0.679718  
9 1976 A 2 3 0.99919  
9 1976 A 2 4 0.997754  
9 1976 A 2 5 0.927575  
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9 1976 A 2 7 0.589854  
9 1976 A 2 8 0.403451  
9 1976 A 2 9 0.249116  
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9 1976 A 2 13 0.0130166  
9 1976 A 2 14 0.00481877  
9 1976 A 2 15 0.00161042  
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**ASAP FINAL TERMINAL YEAR 2006 RUN (F08 FINAL T2006.REP)**

Age Structured Assessment Program (ASAP) Version 2.0  
Start time for run: Tue Apr 22 14:04:08 2008

obj\_fun = 4129.13

Component	Lambda	obj_fun
__Catch_Fleet_1	10	2021.06
__Catch_Fleet_2	10	1350
Catch_Fleet_Total	20	3371.06
Discard_Fleet_Total	0	0
__Index_Fit_1	1	62.4538
__Index_Fit_2	1	41.8752
__Index_Fit_3	1	29.8409
__Index_Fit_4	1	28.0347
__Index_Fit_5	1	4.29183
__Index_Fit_6	1	17.9629
__Index_Fit_7	1	4.6618
__Index_Fit_8	1	-6.56081
__Index_Fit_9	1	-50.6321
__Index_Fit_10	1	-35.3013
__Index_Fit_11	1	11.0003
__Index_Fit_12	1	-6.62937
__Index_Fit_13	1	-36.7012
__Index_Fit_14	1	28.4984
__Index_Fit_15	1	-14.2225
__Index_Fit_16	1	11.9055
__Index_Fit_17	1	-21.0681
__Index_Fit_18	1	-5.35967
__Index_Fit_19	1	-33.838
__Index_Fit_20	1	-46.6582
__Index_Fit_21	1	15.7057
__Index_Fit_22	1	-0.124791
__Index_Fit_23	1	-36.9599
__Index_Fit_24	1	-52.4357
__Index_Fit_25	1	9.62513
__Index_Fit_26	1	-12.6381
__Index_Fit_27	1	1.78529
__Index_Fit_28	1	10.0115
__Index_Fit_29	1	42.0813
__Index_Fit_30	1	29.3935
__Index_Fit_31	1	-4.67064
__Index_Fit_32	1	-10.4854
__Index_Fit_33	1	-21.3929
__Index_Fit_34	1	21.0149
__Index_Fit_35	1	74.6825
__Index_Fit_36	1	19.6284
__Index_Fit_37	1	-1.9789
__Index_Fit_38	1	-4.88607
__Index_Fit_39	1	-32.1625
Index_Fit_Total	39	29.7474
Catch_Age_Comps	see_below	643.015
Discard_Age_Comps	see_below	0
Survey_Age_Comps	see_below	0
__Sel_Param_1	1	0.867088

__Sel_Param_2	1	3.65536
__Sel_Param_3	1	1.13592
__Sel_Param_4	1	2.72343
__Sel_Param_5	1	0.934309
__Sel_Param_6	1	4.19713
__Sel_Param_7	1	1.65259
__Sel_Param_8	1	3.72219
__Sel_Param_9	1	1.22391
__Sel_Param_10	1	3.43685
__Sel_Param_11	1	1.35292
__Sel_Param_12	1	0.207853
Sel_Params_Total	12	25.1096
Index_Sel_Params_Total	0	0
q_year1_Total	0	0
q_devs_Total	390000	0
__Fmult_year1_fleet_1	1	0.609516
__Fmult_year1_fleet_2	1	0.783656
Fmult_year1_fleet_Total	2	1.39317
Fmult_devs_fleet_Total	0	0
N_year_1	1	58.6486
Recruit_devs	0	0
SRR_steepness	0.01	0.0040846
SRR_unexpl_stock	0.01	0.149231
Fmult_Max_penalty	1000	0
F_penalty	0	0

Input and Estimated effective sample sizes for fleet 1

1982	200	27.7271
1983	200	30.8431
1984	200	90.0871
1985	200	331.302
1986	200	114.463
1987	200	164.466
1988	200	397.268
1989	200	163.779
1990	200	134.133
1991	200	21.4239
1992	200	196.706
1993	200	107.51
1994	200	115.255
1995	200	172.335
1996	200	34.3169
1997	200	119.736
1998	200	220.678
1999	200	54.8965
2000	200	190.279
2001	200	177.764
2002	200	92.9021
2003	200	504.807
2004	200	230.483
2005	200	349.825
2006	200	180.447

Total 5000 4223.43

Input and Estimated effective sample sizes for fleet 2

1982	90	498.805
1983	90	57.8055
1984	90	57.5958

1985	90	37.0952
1986	90	14.8764
1987	90	22.4456
1988	90	163.255
1989	90	90.3434
1990	90	26.1162
1991	90	456.218
1992	90	13.0192
1993	90	68.463
1994	90	16.8605
1995	90	17.3074
1996	90	4.79142
1997	90	46.4164
1998	90	35.6569
1999	90	38.242
2000	90	15.9088
2001	90	118.048
2002	90	56.1465
2003	90	653.953
2004	90	122.253
2005	90	61.1901
2006	90	493.346
Total	2250	3186.16

Input and Estimated effective Discard sample sizes for fleet 1

1982	0	1e+15
1983	0	1e+15
1984	0	1e+15
1985	0	1e+15
1986	0	1e+15
1987	0	1e+15
1988	0	1e+15
1989	0	1e+15
1990	0	1e+15
1991	0	1e+15
1992	0	1e+15
1993	0	1e+15
1994	0	1e+15
1995	0	1e+15
1996	0	1e+15
1997	0	1e+15
1998	0	1e+15
1999	0	1e+15
2000	0	1e+15
2001	0	1e+15
2002	0	1e+15
2003	0	1e+15
2004	0	1e+15
2005	0	1e+15
2006	0	1e+15

Total 0 2.5e+16

Input and Estimated effective Discard sample sizes for fleet 2

1982	0	1e+15
1983	0	1e+15
1984	0	1e+15
1985	0	1e+15
1986	0	1e+15

1987	0	1e+15
1988	0	1e+15
1989	0	1e+15
1990	0	1e+15
1991	0	1e+15
1992	0	1e+15
1993	0	1e+15
1994	0	1e+15
1995	0	1e+15
1996	0	1e+15
1997	0	1e+15
1998	0	1e+15
1999	0	1e+15
2000	0	1e+15
2001	0	1e+15
2002	0	1e+15
2003	0	1e+15
2004	0	1e+15
2005	0	1e+15
2006	0	1e+15
Total	0	2.5e+16

Observed and predicted total fleet catch by year and standardized residual  
 fleet 1 total catches

1982	18667	18799.4	-0.0708363
1983	26089	25452.3	0.247711
1984	25641	25416.1	0.0883032
1985	20339	20672	-0.162801
1986	20289	20698.2	-0.200192
1987	17790	17773.7	0.00919516
1988	21320	20895.1	0.201815
1989	9561	9387.99	0.183072
1990	6528	6264.06	0.413753
1991	9835	9648.9	0.191509
1992	10771	10808.8	-0.0351513
1993	9720	10029.8	-0.31453
1994	10819	10981.9	-0.14982
1995	9436	8755.08	0.750847
1996	10314	10064.2	0.245801
1997	9376	9628.44	-0.266338
1998	10735	10930.2	-0.180642
1999	8616	8648.19	-0.0373878
2000	12555	12736.9	-0.144187
2001	10249	10372	-0.119601
2002	10205	10377.6	-0.168168
2003	11729	12000.3	-0.229279
2004	13060	13315.4	-0.194118
2005	12549	12573.5	-0.0195378
2006	11254	11254.8	-0.000685572

fleet 2 total catches

1982	296	296.893	-0.0302043
1983	376	376.201	-0.00536497
1984	415	414.996	0.000106675
1985	92	92.0124	-0.00135211
1986	578	578.089	-0.00153822
1987	522	521.864	0.00261906
1988	341	340.894	0.00310713

1989	754	751.933	0.0275133
1990	1448	1446.44	0.010797
1991	1481	1481.45	-0.00303367
1992	1034	1035.8	-0.0174387
1993	1756	1757.17	-0.0066898
1994	1593	1586.2	0.0429103
1995	1060	1058.23	0.0167191
1996	1144	1147.45	-0.030229
1997	881	882.872	-0.021276
1998	1123	1122.52	0.00426382
1999	2259	2250.9	0.0360075
2000	1678	1674.85	0.0188583
2001	1742	1738.98	0.0173966
2002	1226	1226.33	-0.00267698
2003	1410	1411.96	-0.0139309
2004	1278	1279.35	-0.0105886
2005	1229	1228.35	0.0052756
2006	1083	1082.98	0.000198962

Observed and predicted total fleet Discards by year and standardized residual  
 fleet 1 total Discards

1982	0	0	0
1983	0	0	0
1984	0	0	0
1985	0	0	0
1986	0	0	0
1987	0	0	0
1988	0	0	0
1989	0	0	0
1990	0	0	0
1991	0	0	0
1992	0	0	0
1993	0	0	0
1994	0	0	0
1995	0	0	0
1996	0	0	0
1997	0	0	0
1998	0	0	0
1999	0	0	0
2000	0	0	0
2001	0	0	0
2002	0	0	0
2003	0	0	0
2004	0	0	0
2005	0	0	0
2006	0	0	0

fleet 2 total Discards

1982	0	0	0
1983	0	0	0
1984	0	0	0
1985	0	0	0
1986	0	0	0
1987	0	0	0
1988	0	0	0
1989	0	0	0
1990	0	0	0
1991	0	0	0
1992	0	0	0

1993 0 0 0  
 1994 0 0 0  
 1995 0 0 0  
 1996 0 0 0  
 1997 0 0 0  
 1998 0 0 0  
 1999 0 0 0  
 2000 0 0 0  
 2001 0 0 0  
 2002 0 0 0  
 2003 0 0 0  
 2004 0 0 0  
 2005 0 0 0  
 2006 0 0 0

Index data

index number 1

units = 2

month = 1

starting and ending ages for selectivity = 2 2

selectivity choice = -1

year, obs index, pred index, standardized residual

1992 7.15 2.90895 3.0635  
 1993 6.5 3.33213 2.27616  
 1994 3.76 3.51397 0.230519  
 1995 6.07 4.04061 1.3863  
 1996 22.17 4.84885 5.1778  
 1997 3.86 3.6201 0.218579  
 1998 1.68 3.65433 -2.64722  
 1999 2.11 4.00743 -2.18511  
 2000 0.7 3.19827 -5.17537  
 2001 3.07 3.94221 -0.851832  
 2002 2.77 3.7132 -0.998249  
 2003 8.17 4.18494 2.27884  
 2004 1.45 2.87026 -2.32606  
 2005 2.96 4.15399 -1.15438  
 2006 2.64 2.14549 0.706529

index number 2

units = 2

month = 1

starting and ending ages for selectivity = 3 3

selectivity choice = -1

year, obs index, pred index, standardized residual

1992 4.74 3.42474 1.10714  
 1993 6.7 3.07508 2.65287  
 1994 7.2 3.67237 2.29337  
 1995 4.59 4.21159 0.293087  
 1996 8.33 7.64783 0.291053  
 1997 4.8 9.47655 -2.31708  
 1998 3.25 7.47334 -2.83651  
 1999 4.8 7.5415 -1.53906  
 2000 6.52 8.08791 -0.734076  
 2001 5.33 6.56992 -0.712459  
 2002 10.74 8.24646 0.899954  
 2003 14.36 7.9233 2.02561  
 2004 8.68 8.9371 -0.0994342  
 2005 4.03 6.11793 -1.42205

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2006  9.06  8.80414  0.0975854
index number 3
units = 2
month = 1
starting and ending ages for selectivity = 4  4
selectivity choice = -1
  year, obs index, pred index, standardized residual
1992  0.33  0.470967  -1.21166
1993  0.31  0.500816  -1.63396
1994  0.82  0.560742  1.2946
1995  0.25  0.727502  -3.63863
1996  0.6  0.87877  -1.29988
1997  1.04  1.9528  -2.14621
1998  2.29  3.41843  -1.36472
1999  2.9  2.80203  0.117068
2000  4.96  3.08944  1.61267
2001  6.42  3.20424  2.36729
2002  5.58  2.92339  2.20208
2003  8.48  3.8897  2.65491
2004  4.56  3.78015  0.638913
2005  3.07  4.17359  -1.04612
2006  4.29  2.79982  1.45364
index number 4
units = 2
month = 1
starting and ending ages for selectivity = 5  5
selectivity choice = -1
  year, obs index, pred index, standardized residual
1992  0.04  0.0460303  -0.478334
1993  0.05  0.0840443  -1.76904
1994  0.26  0.112987  2.83897
1995  0.02  0.137356  -6.5637
1996  0.12  0.110345  0.285741
1997  0.43  0.181169  2.94438
1998  0.42  0.680801  -1.64537
1999  0.84  1.27824  -1.43015
2000  2.51  1.27744  2.3008
2001  2.44  1.28587  2.18206
2002  2.26  1.59193  1.19368
2003  2.67  1.55779  1.83543
2004  1.64  2.11267  -0.862713
2005  1.34  1.98228  -1.3339
2006  2.47  2.13146  0.502149
index number 5
units = 2
month = 1
starting and ending ages for selectivity = 6  8
selectivity choice = -1
  year, obs index, pred index, standardized residual
1992  0.04  0.0495524  -0.729499
1993  0.04  0.0197719  2.40024
1994  0.01  0.0305303  -3.80206
1996  0.03  0.03455  -0.481025
1997  0.15  0.037565  4.71645
1998  0.12  0.0990428  0.653833
1999  0.41  0.386608  0.200116
2000  1.08  1.00236  0.254144

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2001  1.34  1.14543  0.534429
2002  1.33  1.44753  -0.288465
2003  1.96  1.92354  0.0639604
2004  1.44  2.18629  -1.4224
2005  1.49  2.64488  -1.9548
2006  2.6   2.713   -0.14492
index number 6
units = 2
month = 1
starting and ending ages for selectivity = 2  2
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982  0.7  0.591094  0.438947
1983  0.32  0.713157  -2.08014
1984  0.17  0.783466  -3.96604
1985  0.55  0.445233  0.548524
1986  1.48  0.536548  2.6337
1987  0.47  0.586939  -0.576732
1988  0.6   0.449166  0.751549
1989  0.06  0.120622  -1.81261
1990  0.63  0.269849  2.20078
1991  0.79  0.341251  2.17887
1992  0.77  0.290155  2.53334
1993  0.73  0.332365  2.04232
1994  0.35  0.350504  -0.00373204
1995  0.79  0.403033  1.74694
1996  1.08  0.483652  2.08525
1997  0.29  0.361089  -0.569089
1998  0.27  0.364504  -0.779006
1999  0.22  0.399723  -1.55001
2000  0.19  0.319013  -1.34511
2001  0.48  0.393218  0.517636
2002  0.34  0.370375  -0.222117
2003  0.54  0.41743  0.668271
2004  0.3   0.286296  0.121368
2005  0.26  0.414343  -1.20963
2006  0.04  0.214004  -4.35328
index number 7
units = 2
month = 1
starting and ending ages for selectivity = 3  3
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982  1.43  0.728323  1.75128
1983  0.39  0.762549  -1.74047
1984  0.33  0.804476  -2.31302
1985  1.56  0.834799  1.62296
1986  0.43  0.501237  -0.397902
1987  0.43  0.536724  -0.575463
1988  0.81  0.661191  0.526904
1989  0.23  0.397224  -1.41834
1990  0.03  0.110109  -3.37511
1991  0.27  0.292389  -0.20678
1992  0.41  0.320567  0.638714
1993  0.5   0.287837  1.43338
1994  0.53  0.343746  1.12387
1995  0.27  0.394219  -0.982431

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1996 0.56 0.715862 -0.637374
1997 0.67 0.887036 -0.728372
1998 0.52 0.699529 -0.769829
1999 0.74 0.705909 0.122421
2000 1.03 0.757055 0.79916
2001 0.89 0.614966 0.959512
2002 0.89 0.771896 0.369554
2003 1.29 0.741647 1.43678
2004 1.45 0.836542 1.42774
2005 0.65 0.572659 0.32883
2006 1.04 0.824096 0.603989
index number 8
units = 2
month = 1
starting and ending ages for selectivity = 4 4
selectivity choice = -1
year, obs index, pred index, standardized residual
1982 0.12 0.094435 0.621876
1983 0.19 0.156945 0.49611
1984 0.09 0.121319 -0.775115
1985 0.21 0.113027 1.60798
1986 0.2 0.128393 1.15047
1987 0.02 0.063304 -2.9908
1988 0.07 0.0877675 -0.587137
1989 0.02 0.061687 -2.92364
1990 0.06 0.0588926 0.0483577
1992 0.01 0.0455997 -3.93849
1993 0.04 0.0484897 -0.499601
1994 0.04 0.0542919 -0.792975
1995 0.02 0.0704379 -3.26798
1996 0.12 0.0850838 0.892543
1997 0.09 0.189073 -1.92684
1998 0.32 0.330977 -0.0875491
1999 0.48 0.271297 1.48103
2000 0.63 0.299124 1.93343
2001 1.02 0.31024 3.08943
2002 0.74 0.283047 2.49456
2003 0.59 0.376607 1.16526
2004 0.85 0.366 2.18714
2005 0.58 0.404093 0.938039
2006 0.24 0.271083 -0.316116
index number 9
units = 2
month = 1
starting and ending ages for selectivity = 5 5
selectivity choice = -1
year, obs index, pred index, standardized residual
1982 0.02 0.0256118 -0.64197
1983 0.03 0.0278189 0.195926
1984 0.05 0.0337121 1.02313
1985 0.04 0.0228999 1.44774
1986 0.02 0.0234121 -0.408878
1987 0.01 0.0217195 -2.01328
1988 0.02 0.0140079 0.924357
1989 0.01 0.0108226 -0.20519
1991 0.02 0.0178671 0.29272
1994 0.01 0.0126056 -0.601053

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1997 0.01 0.0202125 -1.82663
1998 0.06 0.075955 -0.612056
1999 0.13 0.142609 -0.240295
2000 0.12 0.14252 -0.44644
2001 0.2 0.14346 0.862444
2002 0.31 0.177607 1.4458
2003 0.29 0.173798 1.32896
2004 0.27 0.235705 0.352604
2005 0.15 0.221157 -1.00775
2006 0.25 0.237801 0.129858
index number 10
units = 2
month = 1
starting and ending ages for selectivity = 6 8
selectivity choice = -1
year, obs index, pred index, standardized residual
1983 0.02 0.0157397 0.621786
1984 0.02 0.0113545 1.46947
1985 0.02 0.0108902 1.57784
1986 0.01 0.00865949 0.373596
1992 0.01 0.00659288 1.08136
1995 0.01 0.00605114 1.30392
1998 0.02 0.0131775 1.08298
1999 0.03 0.0514376 -1.39953
2000 0.17 0.133362 0.630055
2001 0.1 0.152398 -1.09363
2002 0.19 0.192592 -0.0351721
2003 0.2 0.255924 -0.640006
2004 0.16 0.290882 -1.55156
2005 0.17 0.351898 -1.88848
2006 0.2 0.36096 -1.53263
index number 11
units = 2
month = 1
starting and ending ages for selectivity = 3 3
selectivity choice = -1
year, obs index, pred index, standardized residual
1983 1.52 1.38509 0.16761
1984 1.46 1.46125 -0.00154469
1985 1.39 1.51633 -0.156874
1986 0.8 0.910447 -0.23322
1987 0.83 0.974906 -0.290192
1988 0.58 1.20099 -1.31263
1989 0.62 0.721517 -0.273459
1990 0.21 0.200002 0.0879699
1991 0.38 0.531095 -0.603719
1992 0.84 0.582278 0.660858
1993 1.04 0.522828 1.24023
1994 0.8 0.62438 0.446973
1995 0.67 0.71606 -0.1199
1996 1.16 1.30029 -0.20589
1997 1.24 1.61121 -0.472263
1998 1.29 1.27063 0.0272904
1999 2.13 1.28221 0.915278
2000 1.73 1.37511 0.414029
2001 1.2 1.11702 0.129219
2002 1.36 1.40207 -0.0549427

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2003  1.17  1.34713  -0.254225
2004  1.31  1.5195   -0.267534
2005  1.49  1.04018   0.648109
2006  1.14  1.49689   -0.491171
index number 12
units = 2
month = 1
starting and ending ages for selectivity = 4  4
selectivity choice = -1
  year, obs index, pred index, standardized residual
1983  0.4  0.39768  0.0104919
1984  0.34  0.307408  0.181727
1985  0.43  0.286396  0.732911
1986  0.46  0.325331  0.62466
1987  0.11  0.160405  -0.680271
1988  0.2  0.222392  -0.191383
1989  0.18  0.156307  0.254519
1990  0.05  0.149226  -1.9719
1991  0.03  0.0609517  -1.27839
1992  0.09  0.115544  -0.450561
1993  0.25  0.122867  1.28105
1994  0.03  0.137569  -2.74642
1995  0.09  0.178481  -1.23473
1996  0.28  0.215592  0.471409
1997  0.57  0.479087  0.313345
1998  1.14  0.838655  0.553609
1999  1.63  0.687433  1.55699
2000  1.49  0.757944  1.21895
2001  1.22  0.786109  0.792606
2002  0.93  0.717207  0.468556
2003  0.86  0.954275  -0.187588
2004  1.03  0.927398  0.189232
2005  1.37  1.02392  0.525092
2006  0.54  0.68689  -0.433903
index number 13
units = 2
month = 1
starting and ending ages for selectivity = 5  5
selectivity choice = -1
  year, obs index, pred index, standardized residual
1983  0.03  0.058497  -1.20426
1984  0.12  0.0708891  0.949256
1985  0.07  0.0481534  0.674653
1986  0.05  0.0492305  0.02797
1987  0.11  0.0456712  1.5852
1988  0.03  0.0294555  0.033033
1989  0.03  0.0227575  0.49828
1991  0.04  0.0375705  0.112998
1993  0.03  0.0197169  0.756923
1994  0.01  0.0265068  -1.75797
1995  0.01  0.0322238  -2.11017
1996  0.02  0.025887  -0.465286
1997  0.04  0.0425024  -0.109432
1998  0.29  0.159716  1.07568
1999  0.33  0.299876  0.172628
2000  0.31  0.299688  0.0610064
2001  0.4  0.301665  0.50882

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2002  0.37  0.373468  -0.0168259
2003  0.35  0.365459  -0.0779425
2004  0.25  0.495635  -1.2342
2005  0.66  0.465045  0.631376
2006  0.47  0.500042  -0.111737
index number 14
units = 2
month = 1
starting and ending ages for selectivity = 3  3
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982  1.584  0.789948  1.25469
1983  0.599  0.82707  -0.581821
1984  0.078  0.872545  -4.35464
1985  1.26  0.905433  0.595935
1986  0.522  0.543647  -0.0732771
1987  0.64  0.582137  0.170892
1988  1.005  0.717136  0.608602
1989  0.363  0.430834  -0.308954
1990  0.021  0.119425  -3.13459
1991  0.05  0.317128  -3.33136
1992  0.342  0.347691  -0.02976
1993  0.492  0.312192  0.82029
1994  1.217  0.372831  2.13344
1995  1.302  0.427575  2.00812
1996  0.686  0.776432  -0.223317
1997  1.279  0.96209  0.51347
1998  1.212  0.758718  0.8447
1999  0.878  0.765638  0.24695
2000  1.659  0.821111  1.26834
2001  1.026  0.666999  0.776599
2002  1.511  0.837207  1.06482
2003  1.44  0.804399  1.05012
2004  0.283  0.907324  -2.10104
2005  0.351  0.621112  -1.02924
2006  2.44  0.893825  1.81104
index number 15
units = 2
month = 1
starting and ending ages for selectivity = 4  4
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982  0.142  0.125276  0.225984
1983  0.45  0.2082  1.38995
1984  0.067  0.16094  -1.58037
1985  0.036  0.149939  -2.57291
1986  0.185  0.170323  0.149063
1987  0.013  0.0839778  -3.3644
1988  0.123  0.116431  0.0989854
1989  0.102  0.0818327  0.397279
1990  0.081  0.0781257  0.0651571
1991  0.012  0.0319105  -1.76376
1992  0.09  0.0604916  0.716493
1993  0.065  0.0643255  0.018811
1994  0.048  0.0720226  -0.731774
1995  0.053  0.0934414  -1.0226
1996  0.114  0.11287  0.0179577

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1997  0.181  0.25082  -0.588334
1998  0.659  0.439068  0.7323
1999  1.112  0.359897  2.03439
2000  1.205  0.396812  2.00315
2001  0.73  0.411558  1.03351
2002  0.397  0.375485  0.100482
2003  0.624  0.499599  0.400972
2004  0.323  0.485528  -0.73503
2005  1.029  0.536062  1.17597
2006  0.975  0.359613  1.79871
index number 16
units = 2
month = 1
starting and ending ages for selectivity = 4 4
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982  0.405  0.474024  -0.283799
1983  1.662  0.787798  1.34629
1984  0.625  0.608971  0.0468543
1985  0.267  0.567347  -1.35925
1986  1.895  0.644477  1.94501
1987  0.679  0.317759  1.36936
1988  0.663  0.440556  0.737112
1989  0.429  0.309642  0.587974
1990  0.317  0.295616  0.125952
1992  0.288  0.228891  0.414263
1993  0.186  0.243398  -0.485021
1994  0.478  0.272522  1.0133
1995  0.076  0.353568  -2.77242
1996  0.506  0.427084  0.305773
1997  1.282  0.949065  0.542277
1998  1.508  1.66136  -0.174667
1999  0.59  1.36179  -1.50842
2000  0.94  1.50148  -0.844568
2001  2.303  1.55727  0.705624
2002  1.083  1.42078  -0.489562
2003  1.302  1.89041  -0.672464
2004  1.254  1.83716  -0.688683
2005  1.455  2.02838  -0.599137
2006  2.049  1.36072  0.738194
index number 17
units = 2
month = 1
starting and ending ages for selectivity = 5 5
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982  0.012  0.0460514  -2.42528
1983  0.02  0.0500199  -1.65314
1984  0.154  0.0606162  1.68146
1985  0.127  0.0411752  2.03124
1986  0.04  0.0420962  -0.0921146
1987  0.214  0.0390527  3.06767
1988  0.011  0.0251869  -1.49398
1989  0.006  0.0194596  -2.12183
1990  0.016  0.0224764  -0.612926
1991  0.011  0.032126  -1.93281
1992  0.006  0.00923383  -0.777465

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1994 0.03 0.0226656 0.50558
1997 0.114 0.0363432 2.06162
1998 0.351 0.136571 1.70229
1999 0.262 0.256419 0.0388295
2000 0.379 0.256259 0.70575
2001 0.494 0.257949 1.17179
2002 0.307 0.319347 -0.0711082
2003 0.178 0.312498 -1.01497
2004 0.256 0.42381 -0.909099
2005 0.136 0.397653 -1.93489
2006 1.35 0.427578 2.07339
index number 18
units = 2
month = 1
starting and ending ages for selectivity = 3 3
selectivity choice = -1
year, obs index, pred index, standardized residual
1984 0.271 0.378296 -0.601533
1985 0.325 0.392555 -0.340571
1986 0.1 0.235701 -1.54621
1987 0.086 0.252388 -1.94156
1988 0.223 0.310918 -0.599366
1989 0.049 0.18679 -2.41322
1990 0.022 0.0517775 -1.54354
1991 0.189 0.137493 0.573796
1992 0.188 0.150743 0.398307
1993 0.151 0.135352 0.19729
1994 0.314 0.161643 1.19746
1995 0.051 0.185377 -2.32739
1996 0.266 0.336626 -0.424654
1997 0.507 0.417119 0.351913
1998 0.594 0.328946 1.06578
1999 0.593 0.331946 1.04636
2000 0.726 0.355996 1.28514
2001 0.34 0.289181 0.291957
2002 1.264 0.362975 2.25009
2003 1.016 0.348751 1.9283
2004 0.818 0.393374 1.32026
2005 0.264 0.269286 -0.0357535
2006 0.36 0.387522 -0.132852
index number 19
units = 2
month = 1
starting and ending ages for selectivity = 4 4
selectivity choice = -1
year, obs index, pred index, standardized residual
1984 0.044 0.0701673 -0.841625
1985 0.04 0.0653713 -0.885828
1986 0.082 0.0742584 0.178839
1987 0.014 0.0366131 -1.73368
1988 0.035 0.050762 -0.670498
1989 0.024 0.0356778 -0.714997
1990 0.013 0.0340616 -1.73706
1991 0.029 0.0139125 1.3246
1992 0.021 0.0263734 -0.410874
1993 0.015 0.028045 -1.12848
1994 0.025 0.0314008 -0.411093

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1995  0.02  0.0407391  -1.28303
1996  0.086  0.0492098  1.00675
1997  0.057  0.109354  -1.17497
1998  0.503  0.191427  1.74222
1999  0.385  0.15691  1.61867
2000  0.524  0.173004  1.99847
2001  0.365  0.179433  1.28058
2002  0.465  0.163706  1.88267
2003  0.395  0.217818  1.07342
2004  0.41  0.211683  1.19216
2005  0.15  0.233715  -0.799741
2006  0.068  0.156786  -1.5065
index number 20
units = 2
month = 1
starting and ending ages for selectivity = 5 5
selectivity choice = -1
  year, obs index, pred index, standardized residual
1985  0.058  0.0185776  2.05313
1986  0.008  0.0189931  -1.55927
1987  0.004  0.01762  -2.67395
1988  0.009  0.0113639  -0.420585
1989  0.016  0.00877985  1.08226
1990  0.006  0.010141  -0.94646
1991  0.028  0.0144947  1.18738
1992  0.004  0.00416616  -0.0733963
1993  0.018  0.00760677  1.55332
1994  0.018  0.0102263  1.01964
1995  0.005  0.0124319  -1.64258
1996  0.023  0.00998719  1.50437
1997  0.036  0.0163974  1.41817
1998  0.116  0.0616187  1.14087
1999  0.139  0.115692  0.330996
2000  0.074  0.11562  -0.804747
2001  0.12  0.116382  0.0552014
2002  0.233  0.144084  0.86678
2003  0.232  0.140994  0.898121
2004  0.194  0.191216  0.0260666
2005  0.033  0.179414  -3.05347
2006  0.065  0.192916  -1.96185
index number 21
units = 2
month = 1
starting and ending ages for selectivity = 3 3
selectivity choice = -1
  year, obs index, pred index, standardized residual
1985  0.571  0.999988  -1.01053
1986  0.339  0.600421  -1.03087
1987  1.17  0.64293  1.07973
1988  1.067  0.792026  0.537429
1989  0.884  0.475826  1.11703
1990  0.029  0.131897  -2.73163
1991  0.674  0.350246  1.18048
1992  0.826  0.384  1.38131
1993  0.57  0.344794  0.906542
1994  0.827  0.411766  1.25759
1995  0.3  0.472226  -0.818153

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1996  0.384  0.857515  -1.44883
1997  0.887  1.06256  -0.325678
1998  0.681  0.837951  -0.374017
1999  0.269  0.845594  -2.06547
2000  0.679  0.906859  -0.521838
2001  0.395  0.736654  -1.12393
2002  2.689  0.924637  1.92515
2003  3.087  0.888403  2.24617
2004  1.459  1.00208  0.677491
2005  0.385  0.685975  -1.04163
2006  1.093  0.987167  0.183661
index number 22
units = 2
month = 1
starting and ending ages for selectivity = 4 4
selectivity choice = -1
  year, obs index, pred index, standardized residual
1985  0.331  0.399583  -0.339581
1986  0.528  0.453905  0.272686
1987  0.298  0.223798  0.516399
1988  0.223  0.310283  -0.595683
1989  0.481  0.218081  1.42648
1990  0.095  0.208202  -1.41499
1991  0.11  0.0850404  0.464108
1992  0.34  0.161208  1.34578
1993  0.366  0.171425  1.36784
1994  0.152  0.191937  -0.42071
1995  0.085  0.249018  -1.93841
1996  0.117  0.300796  -1.70286
1997  1.188  0.668426  1.03713
1998  1.373  1.1701  0.288378
1999  1.054  0.959112  0.170131
2000  1.484  1.05749  0.611065
2001  0.871  1.09679  -0.415675
2002  1.137  1.00065  0.230365
2003  1.93  1.33141  0.669559
2004  1.319  1.29391  0.0346299
2005  0.755  1.42859  -1.15006
2006  0.744  0.958355  -0.456575
index number 23
units = 2
month = 1
starting and ending ages for selectivity = 5 5
selectivity choice = -1
  year, obs index, pred index, standardized residual
1985  0.072  0.0572415  0.413673
1986  0.075  0.0585219  0.447396
1987  0.072  0.0542908  0.509115
1988  0.033  0.0350147  -0.106869
1989  0.037  0.0270526  0.564704
1990  0.015  0.0312465  -1.32343
1991  0.042  0.0446613  -0.110797
1992  0.036  0.0128368  1.85965
1993  0.046  0.0234381  1.21599
1994  0.039  0.0315095  0.384611
1995  0.024  0.0383055  -0.843151
1996  0.012  0.0307727  -1.69828

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1997 0.042 0.050524 -0.333227
1998 0.373 0.18986 1.21781
1999 0.321 0.356472 -0.189021
2000 0.346 0.356249 -0.0526451
2001 0.341 0.358599 -0.090751
2002 0.436 0.443954 -0.0326028
2003 0.479 0.434433 0.176118
2004 0.407 0.589177 -0.667097
2005 0.44 0.552814 -0.411616
2006 0.355 0.594416 -0.929576
index number 24
units = 2
month = 1
starting and ending ages for selectivity = 6 8
selectivity choice = -1
year, obs index, pred index, standardized residual
1985 0.025 0.012063 1.31418
1986 0.009 0.00959207 -0.114897
1987 0.007 0.00762591 -0.154444
1988 0.003 0.00902544 -1.98631
1989 0.003 0.00365762 -0.357432
1990 0.001 0.00409602 -2.5428
1991 0.012 0.0070545 0.958032
1992 0.022 0.00730289 1.98872
1993 0.025 0.00291393 3.87615
1994 0.007 0.00449946 0.79701
1995 0.009 0.00670281 0.531454
1996 0.005 0.00509187 -0.0328352
1997 0.005 0.00553622 -0.183718
1998 0.04 0.0145966 1.81797
1999 0.075 0.0569771 0.49564
2000 0.127 0.147724 -0.272601
2001 0.191 0.16881 0.222713
2002 0.134 0.213333 -0.8386
2003 0.183 0.283486 -0.789297
2004 0.203 0.322208 -0.833149
2005 0.119 0.389795 -2.13971
2006 0.151 0.399833 -1.75608
index number 25
units = 2
month = 1
starting and ending ages for selectivity = 4 4
selectivity choice = -1
year, obs index, pred index, standardized residual
1982 1.74 0.329949 2.99849
1983 0.52 0.548355 -0.0957497
1984 0.42 0.423881 -0.0165866
1985 0.49 0.394908 0.389084
1986 0.28 0.448595 -0.849992
1987 0.51 0.22118 1.50661
1988 0.37 0.306654 0.338647
1989 0.24 0.21553 0.193935
1990 0.07 0.205766 -1.94449
1991 0.12 0.0840456 0.642244
1992 0.08 0.159322 -1.24235
1993 0.41 0.16942 1.59379
1994 0.22 0.189692 0.267307

```

```

1995  0.03  0.246105  -3.79533
1996  0.2   0.297277  -0.714765
1997  1.03   0.660607   0.800982
1998  0.96   1.15641   -0.335688
1999  0.36   0.947892  -1.74592
2000  1.91   1.04512   1.08739
2001  1.24   1.08396   0.242545
2002  0.63   0.988947  -0.813183
2003  1.38   1.31584   0.0858589
2004  2.08   1.27878   0.877282
2005  1.3    1.41187   -0.148875
2006  1.38   0.947144  0.678772
index number 26
units = 2
month = 1
starting and ending ages for selectivity = 5 5
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982  0.2   0.0594143  2.18892
1983  0.07   0.0645343  0.146612
1984  0.11   0.0782054  0.61521
1985  0.1    0.0531232  1.14074
1986  0.02   0.0543114  -1.80159
1987  0.13   0.0503848  1.70933
1988  0.02   0.0324955  -0.875307
1992  0.01   0.0119132  -0.31571
1993  0.11   0.0217518  2.9229
1994  0.07   0.0292425  1.57412
1997  0.01   0.046889   -2.78658
1998  0.03   0.1762    -3.19276
1999  0.09   0.330825  -2.34761
2000  0.35   0.330618  0.102736
2001  0.45   0.332799  0.544097
2002  0.3    0.412013  -0.572164
2003  0.4    0.403177  -0.0142652
2004  0.49   0.546788  -0.197751
2005  0.78   0.513041  0.755508
2006  0.69   0.55165   0.403558
index number 27
units = 2
month = 1
starting and ending ages for selectivity = 2 2
selectivity choice = -1
  year, obs index, pred index, standardized residual
1990  0.17   0.196469  -0.260964
1991  0.07   0.248455  -2.28447
1992  0.15   0.211253  -0.61752
1993  0.11   0.241986  -1.42178
1994  0.08   0.255192  -2.0919
1995  0.2    0.293437  -0.691318
1996  0.41   0.352133  0.274381
1997  0.17   0.262898  -0.78622
1998  0.07   0.265385  -2.40334
1999  0.26   0.291027  -0.203304
2000  0.63   0.232264  1.79949
2001  0.42   0.286291  0.69114
2002  0.81   0.26966   1.98349

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2003  1.48  0.303918  2.85483
2004  0.54  0.208444  1.71664
2005  0.55  0.301671  1.08308
2006  0.19  0.15581  0.357768
index number 28
units = 2
month = 1
starting and ending ages for selectivity = 3  8
selectivity choice = -1
  year, obs index, pred index, standardized residual
1990  0.1  0.0950919  0.0907569
1991  0.08  0.252512  -2.07287
1992  0.18  0.276847  -0.776371
1993  0.14  0.248581  -1.03537
1994  0.05  0.296865  -3.21228
1995  0.22  0.340454  -0.787453
1996  0.53  0.61823  -0.277693
1997  0.52  0.766059  -0.698687
1998  0.36  0.604125  -0.933572
1999  0.61  0.609635  0.00107831
2000  1.89  0.653805  1.91433
2001  0.55  0.531095  0.0630783
2002  1.11  0.666622  0.919531
2003  2.25  0.640499  2.26584
2004  1.53  0.722452  1.35321
2005  1.89  0.494558  2.41774
2006  1.09  0.711703  0.768732
index number 29
units = 2
month = 1
starting and ending ages for selectivity = 2  2
selectivity choice = -1
  year, obs index, pred index, standardized residual
1988  3.06  5.01494  -0.890885
1989  0.51  1.34674  -1.75114
1990  1.44  3.01287  -1.33135
1991  2.69  3.81007  -0.627769
1992  3  3.23958  -0.138556
1993  5.69  3.71086  0.77085
1994  1.07  3.91337  -2.33852
1995  2.93  4.49987  -0.773734
1996  5.1  5.39998  -0.103071
1997  8.25  4.03156  1.29133
1998  5.8  4.06968  0.638925
1999  6.12  4.46291  0.569437
2000  3.91  3.56179  0.168211
2001  3.32  4.39028  -0.503918
2002  9.11  4.13524  1.42436
2003  5.61  4.6606  0.334358
2004  6.27  3.19649  1.21498
2005  5.99  4.62614  0.465938
2006  5.74  2.38935  1.58055
index number 30
units = 2
month = 1
starting and ending ages for selectivity = 3  3
selectivity choice = -1

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year, obs index, pred index, standardized residual
1988 1.03 1.22293 -0.30963
1989 0.18 0.734702 -2.53647
1990 0.11 0.203657 -1.1108
1991 0.27 0.5408 -1.25268
1992 0.57 0.592918 -0.0710883
1993 0.2 0.532381 -1.76559
1994 0.08 0.63579 -3.73813
1995 0.28 0.729144 -1.72599
1996 2.7 1.32405 1.28501
1997 5.25 1.64065 2.09758
1998 2.67 1.29384 1.30648
1999 3.46 1.30564 1.75753
2000 1.82 1.40024 0.472832
2001 1.18 1.13744 0.066253
2002 4.13 1.42769 1.91559
2003 2.55 1.37174 1.11812
2004 2.49 1.54726 0.858043
2005 1.24 1.05918 0.284235
2006 3.22 1.52424 1.34872
index number 31
units = 2
month = 1
starting and ending ages for selectivity = 4 4
selectivity choice = -1

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year, obs index, pred index, standardized residual
1990 0.03 0.0783445 -1.7311
1991 0.02 0.0319999 -0.847593
1992 0.06 0.0606611 -0.0197615
1993 0.01 0.0645057 -3.36181
1995 0.05 0.0937032 -1.13272
1996 0.18 0.113187 0.836624
1997 1.02 0.251523 2.52478
1998 0.29 0.440298 -0.753039
1999 0.65 0.360905 1.06103
2000 0.45 0.397924 0.221794
2001 0.41 0.412711 -0.0118832
2002 1.28 0.376537 2.20662
2003 0.57 0.500999 0.232696
2004 0.57 0.486888 0.284218
2005 0.53 0.537564 -0.0255538
2006 0.48 0.36062 0.515697
index number 32
units = 2
month = 1
starting and ending ages for selectivity = 5 8
selectivity choice = -1

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year, obs index, pred index, standardized residual
1992 0.02 0.0114097 1.01218
1993 0.01 0.0208324 -1.32355
1994 0.02 0.0280065 -0.607208
1995 0.16 0.0340469 2.79062
1996 0.05 0.0273516 1.08789
1997 0.18 0.0449071 2.50375
1998 0.04 0.168753 -2.59607
1999 0.18 0.316842 -1.01972
2000 0.22 0.316644 -0.656704

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```

2001  0.15  0.318733  -1.35924
2002  0.81  0.394598  1.29693
2003  0.51  0.386136  0.501742
2004  0.43  0.523677  -0.355428
2005  0.32  0.491356  -0.773377
2006  0.4   0.528333  -0.501815
index number 33
units = 2
month = 1
starting and ending ages for selectivity = 1 1
selectivity choice = -1
  year, obs index, pred index, standardized residual
1985  0.24  0.0875388  1.81882
1986  0.172  0.0966126  1.04017
1987  0.075  0.0734421  0.0378544
1988  0.015  0.0199672  -0.515841
1990  0.032  0.0566985  -1.03156
1991  0.036  0.0485499  -0.539344
1992  0.013  0.0551377  -2.60568
1993  0.084  0.0582901  0.658928
1994  0.132  0.0664654  1.23734
1995  0.023  0.0771955  -2.18362
1996  0.069  0.0575173  0.328255
1997  0.033  0.0578618  -1.01269
1999  0.044  0.0507513  -0.257428
2000  0.012  0.0624614  -2.97494
2001  0.021  0.0587661  -1.85576
2002  0.442  0.0661368  3.42568
2004  0.255  0.0656517  2.44701
2005  0.067  0.033922  1.22744
2006  0.098  0.0644636  0.755378
index number 34
units = 2
month = 1
starting and ending ages for selectivity = 1 1
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982  2.27  1.80339  0.414979
1983  5.01  1.99535  1.66023
1984  1.58  1.13756  0.592481
1985  1.26  1.36516  -0.144557
1986  1.26  1.50666  -0.32242
1987  0.39  1.14532  -1.94278
1988  0.54  0.311386  0.992825
1989  1.24  0.705588  1.01681
1990  2.54  0.884208  1.90298
1991  2.64  0.757131  2.25242
1992  0.89  0.859867  0.0621154
1993  0.5   0.909029  -1.07801
1994  2.41  1.03652  1.52162
1995  0.63  1.20386  -1.16781
1996  0.81  0.896976  -0.183936
1997  0.89  0.902348  -0.0248493
1998  0.73  0.989671  -0.548821
1999  0.53  0.791461  -0.723164
2000  0.57  0.97408  -0.966356
2001  0.47  0.916452  -1.20426

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2002  0.77  1.0314  -0.527092
2003  0.44  0.707365 -0.856197
2004  1.3   1.02383  0.430669
2005  0.35  0.52901  -0.744932
2006  0.8   1.0053   -0.411952
index number 35
units = 2
month = 1
starting and ending ages for selectivity = 1  1
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982  3.408  15.2728  -2.70498
1983  17.699  16.8985  0.0834698
1984  13.31   9.63392  0.582899
1985  12.843  11.5614  0.18958
1986  59.526  12.7598  2.77741
1987  7.584   9.69965  -0.443722
1988  1.763   2.63711  -0.726163
1989  2.855   5.97557  -1.33199
1990  4.733   7.48829  -0.827359
1991  7.337   6.41209  0.242997
1992  8.487   7.28215  0.276115
1993  4.145   7.6985   -1.11652
1994  22.311  8.77823  1.68221
1995  13.067  10.1954  0.447521
1996  6.493   7.59643  -0.283047
1997  7.997   7.64192  0.0819045
1998  14.983  8.38146  1.04758
1999  8.565   6.70283  0.442108
2000  9.874   8.24941  0.324182
2001  13.543  7.76136  1.00397
2002  5.406   8.73483  -0.865281
2003  8.18    5.99062  0.561748
2004  6.993   8.67076  -0.387812
2005  2.198   4.48015  -1.28421
2006  9.658   8.51384  0.227395
index number 36
units = 2
month = 1
starting and ending ages for selectivity = 1  1
selectivity choice = -1
  year, obs index, pred index, standardized residual
1988  0.17   0.42419  -1.64899
1989  1   0.961196  0.0713718
1990  1.28   1.20452  0.109601
1991  1   1.03141  -0.0557768
1992  1.1   1.17137  -0.113361
1993  2.55   1.23834  1.30263
1994  1.66   1.41202  0.291786
1995  4.95   1.63997  1.99222
1996  1.66   1.22192  0.55255
1997  1.65   1.22924  0.530884
1998  0.67   1.34819  -1.261
1999  1.03   1.07818  -0.0824413
2000  0.95   1.32695  -0.602653
2001  0.62   1.24845  -1.26226
2002  1.51   1.40504  0.129928

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2003 0.6 0.963618 -0.85438
2004 0.9 1.39473 -0.789992
2005 3.11 0.720652 2.63695
2006 0.81 1.36949 -0.947062
index number 37
units = 2
month = 1
starting and ending ages for selectivity = 1 1
selectivity choice = -1
year, obs index, pred index, standardized residual
1982 0.55 0.523346 0.0895843
1983 0.96 0.579053 0.911683
1984 0.18 0.330121 -1.09376
1985 0.59 0.39617 0.718248
1986 0.39 0.437235 -0.206172
1987 0.07 0.332374 -2.80925
1988 0.06 0.0903647 -0.738502
1989 0.31 0.204762 0.747904
1990 0.44 0.256598 0.9725
1991 0.76 0.21972 2.23793
1992 0.99 0.249534 2.48526
1993 0.23 0.263801 -0.247273
1994 0.75 0.3008 1.64762
1995 0.93 0.34936 1.76566
1996 0.11 0.260303 -1.55338
1997 0.17 0.261862 -0.7791
1998 0.38 0.287204 0.504911
1999 0.21 0.229683 -0.161569
2000 0.22 0.282679 -0.452081
2001 0.12 0.265955 -1.4352
2002 0.06 0.299313 -2.8983
2003 0.18 0.205278 -0.236981
2004 0.36 0.297117 0.346209
2005 0.16 0.153519 0.0745648
2006 0.31 0.29174 0.109481
index number 38
units = 2
month = 1
starting and ending ages for selectivity = 1 1
selectivity choice = -1
year, obs index, pred index, standardized residual
1986 0.32 0.287844 0.190984
1987 0.26 0.218811 0.311039
1988 0.01 0.0594895 -3.21582
1989 0.14 0.1348 0.068252
1990 0.36 0.168925 1.36453
1991 0.38 0.144648 1.74183
1992 0.37 0.164275 1.46428
1993 0.05 0.173667 -2.24543
1994 0.57 0.198024 1.90662
1995 0.3 0.229993 0.479218
1996 0.08 0.171365 -1.37376
1997 0.22 0.172391 0.439777
1998 0.39 0.189074 1.30567
1999 0.35 0.151206 1.51356
2000 0.21 0.186095 0.217938
2001 0.14 0.175085 -0.403294

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2002  0.13  0.197046  -0.750029
2003  0.21  0.13514  0.794924
2004  0.27  0.1956  0.581319
2005  0.01  0.101066  -4.17157
2006  0.17  0.19206  -0.220033
index number 39
units = 2
month = 1
starting and ending ages for selectivity = 1 1
selectivity choice = -1
year, obs index, pred index, standardized residual
1990  0.02  0.0319418  -0.844316
1992  0.01  0.0310625  -2.04399
1993  0.01  0.0328385  -2.14425
1994  0.04  0.0374441  0.119076
1995  0.03  0.0434891  -0.669618
1996  0.02  0.0324031  -0.870171
1997  0.04  0.0325972  0.36907
1999  0.03  0.0285914  0.0867281
2000  0.09  0.0351884  1.69354
2001  0.01  0.0331066  -2.15892
2002  0.11  0.037259  1.95232
2003  0.05  0.0255534  1.21052
2004  0.1  0.0369857  1.79371
2005  0.04  0.0191104  1.33206
2006  0.04  0.0363164  0.174226

```

Input and Estimated effective sample sizes for index 1

```

1992  0  0
1993  0  0
1994  0  0
1995  0  0
1996  0  0
1997  0  0
1998  0  0
1999  0  0
2000  0  0
2001  0  0
2002  0  0
2003  0  0
2004  0  0
2005  0  0
2006  0  0
Total  0  0

```

Input and Estimated effective sample sizes for index 2

```

1992  0  0
1993  0  0
1994  0  0
1995  0  0
1996  0  0
1997  0  0
1998  0  0
1999  0  0
2000  0  0
2001  0  0
2002  0  0
2003  0  0

```



2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 3

1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0

Total 0 0

Input and Estimated effective sample sizes for index 4

1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0

Total 0 0

Input and Estimated effective sample sizes for index 5

1992 0 0  
1993 0 0  
1994 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0

Total 0 0

Input and Estimated effective sample sizes for index 6

1982 0 0  
1983 0 0

1984 0 0  
1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 7

1982 0 0  
1983 0 0  
1984 0 0  
1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 8

1982 0 0  
1983 0 0  
1984 0 0  
1985 0 0  
1986 0 0

1987 0 0  
1988 0 0  
1989 0 0  
1990 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 9

1982 0 0  
1983 0 0  
1984 0 0  
1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1991 0 0  
1994 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 10

1983 0 0  
1984 0 0  
1985 0 0  
1986 0 0  
1992 0 0  
1995 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0

2006	0	0
Total	0	0
Input and Estimated effective sample sizes for index 11		
1983	0	0
1984	0	0
1985	0	0
1986	0	0
1987	0	0
1988	0	0
1989	0	0
1990	0	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
Total	0	0
Input and Estimated effective sample sizes for index 12		
1983	0	0
1984	0	0
1985	0	0
1986	0	0
1987	0	0
1988	0	0
1989	0	0
1990	0	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
Total	0	0
Input and Estimated effective sample sizes for index 13		
1983	0	0
1984	0	0

1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1991 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 14

1982 0 0  
1983 0 0  
1984 0 0  
1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 15

1982 0 0  
1983 0 0  
1984 0 0  
1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0

1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 16

1982 0 0  
1983 0 0  
1984 0 0  
1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1990 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0

Total 0 0

Input and Estimated effective sample sizes for index 17

1982 0 0  
1983 0 0  
1984 0 0  
1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1994 0 0

1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
Total	0	0

Input and Estimated effective sample sizes for index 18

1984	0	0
1985	0	0
1986	0	0
1987	0	0
1988	0	0
1989	0	0
1990	0	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
Total	0	0

Input and Estimated effective sample sizes for index 19

1984	0	0
1985	0	0
1986	0	0
1987	0	0
1988	0	0
1989	0	0
1990	0	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0

2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 20

1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 21

1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 22

1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0



1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 23

1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 24

1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0

1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
Total	0	0

Input and Estimated effective sample sizes for index 25

1982	0	0
1983	0	0
1984	0	0
1985	0	0
1986	0	0
1987	0	0
1988	0	0
1989	0	0
1990	0	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
Total	0	0

Input and Estimated effective sample sizes for index 26

1982	0	0
1983	0	0
1984	0	0
1985	0	0
1986	0	0
1987	0	0
1988	0	0
1992	0	0
1993	0	0
1994	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0

2006 0 0  
Total 0 0  
Input and Estimated effective sample sizes for index 27  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0

Total 0 0  
Input and Estimated effective sample sizes for index 28  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0

Total 0 0  
Input and Estimated effective sample sizes for index 29  
1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0

2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 30

1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0

Total 0 0

Input and Estimated effective sample sizes for index 31

1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0

Total 0 0

Input and Estimated effective sample sizes for index 32

1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0

2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 33

1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2004 0 0  
2005 0 0  
2006 0 0

Total 0 0

Input and Estimated effective sample sizes for index 34

1982 0 0  
1983 0 0  
1984 0 0  
1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0

Total 0 0

Input and Estimated effective sample sizes for index 35

1982 0 0  
1983 0 0  
1984 0 0  
1985 0 0  
1986 0 0

1987 0 0  
1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 36

1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 37

1982 0 0  
1983 0 0  
1984 0 0  
1985 0 0  
1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0

1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 38

1986 0 0  
1987 0 0  
1988 0 0  
1989 0 0  
1990 0 0  
1991 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1998 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Input and Estimated effective sample sizes for index 39

1990 0 0  
1992 0 0  
1993 0 0  
1994 0 0  
1995 0 0  
1996 0 0  
1997 0 0  
1999 0 0  
2000 0 0  
2001 0 0  
2002 0 0  
2003 0 0  
2004 0 0  
2005 0 0  
2006 0 0  
Total 0 0

Survey proportions at age by index

Index number 1

N/A

Index number 2

N/A  
Index number 3  
N/A  
Index number 4  
N/A  
Index number 5  
N/A  
Index number 6  
N/A  
Index number 7  
N/A  
Index number 8  
N/A  
Index number 9  
N/A  
Index number 10  
N/A  
Index number 11  
N/A  
Index number 12  
N/A  
Index number 13  
N/A  
Index number 14  
N/A  
Index number 15  
N/A  
Index number 16  
N/A  
Index number 17  
N/A  
Index number 18  
N/A  
Index number 19  
N/A  
Index number 20  
N/A  
Index number 21  
N/A  
Index number 22  
N/A  
Index number 23  
N/A  
Index number 24  
N/A  
Index number 25  
N/A  
Index number 26  
N/A  
Index number 27  
N/A  
Index number 28  
N/A  
Index number 29  
N/A  
Index number 30  
N/A



Index number 31  
 N/A  
 Index number 32  
 N/A  
 Index number 33  
 N/A  
 Index number 34  
 N/A  
 Index number 35  
 N/A  
 Index number 36  
 N/A  
 Index number 37  
 N/A  
 Index number 38  
 N/A  
 Index number 39  
 N/A

Index Selectivity at Age

0 1 0 0 0 0 0 0  
 0 0 1 0 0 0 0 0  
 0 0 0 1 0 0 0 0  
 0 0 0 0 1 0 0 0  
 0 0 0 0 0 1 1 1  
 0 1 0 0 0 0 0 0  
 0 0 1 0 0 0 0 0  
 0 0 0 1 0 0 0 0  
 0 0 0 0 1 0 0 0  
 0 0 0 0 0 1 1 1  
 0 0 1 0 0 0 0 0  
 0 0 0 1 0 0 0 0  
 0 0 0 0 1 0 0 0  
 0 0 1 0 0 0 0 0  
 0 0 0 1 0 0 0 0  
 0 0 0 1 0 0 0 0  
 0 0 0 0 1 0 0 0  
 0 0 1 0 0 0 0 0  
 0 0 0 1 0 0 0 0  
 0 0 0 0 0 1 1 1  
 0 0 0 1 0 0 0 0  
 0 0 0 0 1 0 0 0  
 0 1 0 0 0 0 0 0  
 0 0 1 0 0 0 0 0  
 0 1 0 0 0 0 0 0  
 0 0 1 0 0 0 0 0  
 0 0 0 1 0 0 0 0  
 0 0 0 0 1 0 0 0  
 1 0 0 0 0 0 0 0  
 1 0 0 0 0 0 0 0  
 1 0 0 0 0 0 0 0  
 1 0 0 0 0 0 0 0  
 1 0 0 0 0 0 0 0

1 0 0 0 0 0 0 0  
1 0 0 0 0 0 0 0

Deviations section: only applicable if associated lambda > 0

Nyear1 observed, expected, standardized residual

2	46097.5	29432.6	0.582463
3	20491.6	13698.4	0.522845
4	3100.5	3444.62	-0.136638
5	692.968	836.223	-0.243953
6	234.633	202.709	0.189872
7	62.2202	49.1364	0.306488
8	17.4489	15.7722	0.131159

Fleet Obs, Initial, and Standardized Residual for Fmult

1	1.16717	0.9	0.337468
2	0.0183138	0.1	-2.20377

Standardized Residuals for Fmult\_devs by fleet and year

N/A

Index Obs, Initial, and Standardized Residual for q\_year1

N/A

Standardized Residuals for catchability deviations by index and year

index 1 q\_devs standardized residuals

2	0
3	0
4	0
5	0
6	0
7	0
8	0
9	0
10	0
11	0
12	0
13	0
14	0
15	0

index 2 q\_devs standardized residuals

2	0
3	0
4	0
5	0
6	0
7	0
8	0
9	0
10	0
11	0
12	0
13	0
14	0
15	0

index 3 q\_devs standardized residuals

2	0
3	0

4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
index 4 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
index 5 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
index 6 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0

17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
23 0  
24 0  
25 0

index 7 q\_devs standardized residuals

2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
23 0  
24 0  
25 0

index 8 q\_devs standardized residuals

2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
23 0

24 0  
index 9 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
index 10 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
index 11 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0

```
22 0
23 0
24 0
  index 12 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
20 0
21 0
22 0
23 0
24 0
  index 13 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
20 0
21 0
22 0
  index 14 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
```

```
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
20 0
21 0
22 0
23 0
24 0
25 0
  index 15 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
20 0
21 0
22 0
23 0
24 0
25 0
  index 16 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
```

```
16 0
17 0
18 0
19 0
20 0
21 0
22 0
23 0
24 0
  index 17 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
20 0
21 0
22 0
  index 18 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
20 0
21 0
22 0
23 0
  index 19 q_devs standardized residuals
2 0
3 0
```



```
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
20 0
21 0
22 0
23 0
  index 20 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
20 0
21 0
22 0
  index 21 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
```

16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
index 22 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
index 23 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
index 24 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0

```
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
20 0
21 0
22 0
  index 25 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
20 0
21 0
22 0
23 0
24 0
25 0
  index 26 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
```

17 0  
18 0  
19 0  
20 0  
index 27 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
index 28 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
index 29 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0

```
index 30 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
index 31 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
index 32 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
index 33 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
```

8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
index 34 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
23 0  
24 0  
25 0  
index 35 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0

21 0  
22 0  
23 0  
24 0  
25 0  
index 36 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
index 37 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
23 0  
24 0  
25 0  
index 38 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0

9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0

index 39 q\_devs standardized residuals

2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0

Obs, Initial, and Standardized Residual for SRR steepness  
0.999992 0.7 0.463037

Obs, Initial, and Standardized Residual for SRR unexpl S  
208922 22026.5 2.92066

End of Deviations Section

Selectivity by age and year for each fleet

fleet 1 selectivity at age

0.0215206	0.416827	0.958726	0.998677	0.999959	0.999999	1	1
0.0215206	0.416827	0.958726	0.998677	0.999959	0.999999	1	1
0.0215206	0.416827	0.958726	0.998677	0.999959	0.999999	1	1
0.0215206	0.416827	0.958726	0.998677	0.999959	0.999999	1	1
0.0215206	0.416827	0.958726	0.998677	0.999959	0.999999	1	1
0.0215206	0.416827	0.958726	0.998677	0.999959	0.999999	1	1
0.0215206	0.416827	0.958726	0.998677	0.999959	0.999999	1	1
0.0215206	0.416827	0.958726	0.998677	0.999959	0.999999	1	1
0.0215206	0.416827	0.958726	0.998677	0.999959	0.999999	1	1
0.0215206	0.416827	0.958726	0.998677	0.999959	0.999999	1	1
0.0215206	0.416827	0.958726	0.998677	0.999959	0.999999	1	1
0.0215206	0.416827	0.958726	0.998677	0.999959	0.999999	1	1
0.00475839	0.0805912	0.616423	0.967173	0.998152	0.999899	0.999995	1
0.00475839	0.0805912	0.616423	0.967173	0.998152	0.999899	0.999995	1
0.00475839	0.0805912	0.616423	0.967173	0.998152	0.999899	0.999995	1
0.00475839	0.0805912	0.616423	0.967173	0.998152	0.999899	0.999995	1
0.00475839	0.0805912	0.616423	0.967173	0.998152	0.999899	0.999995	1



```

0.00475839 0.0805912 0.616423 0.967173 0.998152 0.999899 0.999995 1
0.00475839 0.0805912 0.616423 0.967173 0.998152 0.999899 0.999995 1
0.00475839 0.0805912 0.616423 0.967173 0.998152 0.999899 0.999995 1
0.00475839 0.0805912 0.616423 0.967173 0.998152 0.999899 0.999995 1
0.00475839 0.0805912 0.616423 0.967173 0.998152 0.999899 0.999995 1
0.00475839 0.0805912 0.616423 0.967173 0.998152 0.999899 0.999995 1
0.00475839 0.0805912 0.616423 0.967173 0.998152 0.999899 0.999995 1
fleet 2 selectivity at age
0.133702 1 0.0802054 0.00245455 7.25202e-05 2.14053e-06 6.31787e-08
1.86475e-09
0.133702 1 0.0802054 0.00245455 7.25202e-05 2.14053e-06 6.31787e-08
1.86475e-09
0.133702 1 0.0802054 0.00245455 7.25202e-05 2.14053e-06 6.31787e-08
1.86475e-09
0.133702 1 0.0802054 0.00245455 7.25202e-05 2.14053e-06 6.31787e-08
1.86475e-09
0.133702 1 0.0802054 0.00245455 7.25202e-05 2.14053e-06 6.31787e-08
1.86475e-09
0.133702 1 0.0802054 0.00245455 7.25202e-05 2.14053e-06 6.31787e-08
1.86475e-09
0.133702 1 0.0802054 0.00245455 7.25202e-05 2.14053e-06 6.31787e-08
1.86475e-09
0.133702 1 0.0802054 0.00245455 7.25202e-05 2.14053e-06 6.31787e-08
1.86475e-09
0.133702 1 0.0802054 0.00245455 7.25202e-05 2.14053e-06 6.31787e-08
1.86475e-09
0.133702 1 0.0802054 0.00245455 7.25202e-05 2.14053e-06 6.31787e-08
1.86475e-09
0.133702 1 0.0802054 0.00245455 7.25202e-05 2.14053e-06 6.31787e-08
1.86475e-09
0.133702 1 0.0802054 0.00245455 7.25202e-05 2.14053e-06 6.31787e-08
1.86475e-09
0.0518731 0.678162 1 0.611287 0.268835 0.0975971 0.0326055 0.010573
0.0518731 0.678162 1 0.611287 0.268835 0.0975971 0.0326055 0.010573
0.0518731 0.678162 1 0.611287 0.268835 0.0975971 0.0326055 0.010573
0.0518731 0.678162 1 0.611287 0.268835 0.0975971 0.0326055 0.010573
0.0518731 0.678162 1 0.611287 0.268835 0.0975971 0.0326055 0.010573
0.0518731 0.678162 1 0.611287 0.268835 0.0975971 0.0326055 0.010573
0.0518731 0.678162 1 0.611287 0.268835 0.0975971 0.0326055 0.010573
0.0518731 0.678162 1 0.611287 0.268835 0.0975971 0.0326055 0.010573
0.0518731 0.678162 1 0.611287 0.268835 0.0975971 0.0326055 0.010573
0.0518731 0.678162 1 0.611287 0.268835 0.0975971 0.0326055 0.010573
0.0518731 0.678162 1 0.611287 0.268835 0.0975971 0.0326055 0.010573
0.0518731 0.678162 1 0.611287 0.268835 0.0975971 0.0326055 0.010573
0.0518731 0.678162 1 0.611287 0.268835 0.0975971 0.0326055 0.010573
0.0518731 0.678162 1 0.611287 0.268835 0.0975971 0.0326055 0.010573
0.0518731 0.678162 1 0.611287 0.268835 0.0975971 0.0326055 0.010573
Fmult by year for each fleet
1982 1.16717 0.0183138
1983 1.48343 0.020692
1984 1.61285 0.0237742
1985 1.51984 0.00752327
1986 1.72254 0.0411853
1987 1.45364 0.0344747
1988 2.03915 0.0324351
1989 1.54132 0.20824
1990 1.13723 0.205264

```

1991 1.48912 0.201339  
 1992 1.52686 0.131097  
 1993 1.29194 0.187333  
 1994 1.20967 0.137756  
 1995 1.70026 0.0708106  
 1996 1.38945 0.0604837  
 1997 0.857348 0.0429645  
 1998 0.778703 0.0528017  
 1999 0.534662 0.114668  
 2000 0.654278 0.0743959  
 2001 0.474666 0.0689756  
 2002 0.416379 0.0465999  
 2003 0.39584 0.0478539  
 2004 0.433208 0.0462099  
 2005 0.457068 0.0517367  
 2006 0.383415 0.047729

Directed F by age and year for each fleet

fleet 1 directed F at age  
 0.0251183 0.486509 1.119 1.16563 1.16712 1.16717 1.16717 1.16717  
 0.0319243 0.618333 1.4222 1.48146 1.48337 1.48343 1.48343 1.48343  
 0.0347094 0.672278 1.54628 1.61071 1.61278 1.61284 1.61285 1.61285  
 0.0327079 0.633511 1.45711 1.51783 1.51978 1.51984 1.51984 1.51984  
 0.0370702 0.718002 1.65144 1.72026 1.72247 1.72254 1.72254 1.72254  
 0.0312833 0.605918 1.39365 1.45172 1.45358 1.45364 1.45364 1.45364  
 0.0438838 0.849974 1.95499 2.03645 2.03907 2.03915 2.03915 2.03915  
 0.0331701 0.642463 1.4777 1.53928 1.54125 1.54132 1.54132 1.54132  
 0.0244739 0.474029 1.09029 1.13573 1.13718 1.13723 1.13723 1.13723  
 0.0320467 0.620704 1.42765 1.48715 1.48905 1.48911 1.48912 1.48912  
 0.032859 0.636437 1.46384 1.52484 1.5268 1.52686 1.52686 1.52686  
 0.0278033 0.538514 1.23861 1.29023 1.29188 1.29193 1.29194 1.29194  
 0.0260328 0.504223 1.15974 1.20807 1.20962 1.20967 1.20967 1.20967  
 0.00809047 0.137026 1.04808 1.64444 1.69711 1.70008 1.70025 1.70026  
 0.00661154 0.111977 0.85649 1.34384 1.38688 1.38931 1.38944 1.38945  
 0.00407959 0.0690947 0.52849 0.829205 0.855764 0.857262 0.857344 0.857348  
 0.00370537 0.0627566 0.480011 0.753141 0.777264 0.778625 0.778699 0.778703  
 0.00254413 0.0430891 0.329578 0.517111 0.533674 0.534609 0.53466 0.534662  
 0.00311331 0.0527291 0.403312 0.6328 0.653069 0.654212 0.654275 0.654278  
 0.00225864 0.0382539 0.292595 0.459084 0.473789 0.474618 0.474664 0.474666  
 0.00198129 0.0335565 0.256666 0.402711 0.41561 0.416337 0.416377 0.416379  
 0.00188356 0.0319012 0.244005 0.382846 0.395109 0.395801 0.395838 0.39584  
 0.00206137 0.0349128 0.26704 0.418987 0.432408 0.433164 0.433206 0.433208  
 0.0021749 0.0368356 0.281747 0.442064 0.456223 0.457022 0.457065 0.457068  
 0.00182444 0.0308999 0.236346 0.370829 0.382707 0.383377 0.383413 0.383415  
 fleet 2 directed F at age  
 0.0024486 0.0183138 0.00146887 4.49522e-05 1.32812e-06 3.92012e-08 1.15704e-09 3.41506e-11  
 0.00276657 0.020692 0.00165961 5.07896e-05 1.50059e-06 4.42918e-08 1.30729e-09 3.85854e-11  
 0.00317867 0.0237742 0.00190682 5.83551e-05 1.72411e-06 5.08894e-08 1.50202e-09 4.43329e-11  
 0.00100588 0.00752327 0.000603407 1.84663e-05 5.45589e-07 1.61038e-08 4.7531e-10 1.4029e-11  
 0.00550657 0.0411853 0.00330328 0.000101091 2.98676e-06 8.81582e-08 2.60203e-09 7.68001e-11  
 0.00460934 0.0344747 0.00276505 8.46199e-05 2.50011e-06 7.37939e-08 2.17806e-09 6.42865e-11





0.00445842 0.0662505 0.313249 0.447235 0.44483 0.437674 0.434712 0.433697  
 0.00485865 0.0719215 0.333484 0.47369 0.470132 0.462071 0.458752 0.457615  
 0.00430029 0.0632679 0.284075 0.400005 0.395538 0.388035 0.38497 0.38392

Average F for ages 4 to 8

Freport unweighted in .std and MCMC files

year	unweighted	Nweighted	Bweighted
1982	1.16686	1.16603	1.16616
1983	1.48303	1.48182	1.48201
1984	1.61242	1.6112	1.61138
1985	1.51943	1.51819	1.51838
1986	1.72209	1.72069	1.72089
1987	1.45326	1.45225	1.45249
1988	2.03861	2.03691	2.03718
1989	1.541	1.54001	1.54013
1990	1.13702	1.1364	1.13646
1991	1.48881	1.48825	1.48842
1992	1.52651	1.5254	1.52555
1993	1.29168	1.29088	1.29094
1994	1.20941	1.20863	1.20877
1995	1.70289	1.69252	1.69571
1996	1.39213	1.38344	1.38466
1997	0.860157	0.856479	0.857079
1998	0.784067	0.786331	0.786586
1999	0.554356	0.57827	0.574694
2000	0.664917	0.674681	0.672329
2001	0.485448	0.49604	0.493032
2002	0.422997	0.428309	0.426433
2003	0.402858	0.408729	0.40649
2004	0.43963	0.444377	0.442453
2005	0.464452	0.469907	0.467607
2006	0.390494	0.39498	0.392482

Population Numbers at the Start of the Year

74147.3 46097.5 20491.6 3100.5 692.968 234.633 62.2202 17.4489  
 82039.7 55616.9 21454.6 5152.84 752.685 167.982 56.8748 19.3542  
 46771.4 61100.1 22634.2 3983.17 912.135 132.991 29.6788 13.5023  
 56129.1 34722.3 23487.3 3710.91 619.593 141.6 20.6442 6.72408  
 61947.2 41843.7 14102.4 4215.41 633.452 105.56 24.123 4.67397  
 47090.5 45773.5 15100.9 2078.41 587.654 88.121 14.6838 4.01228  
 12802.8 35029.1 18602.8 2881.59 379.006 106.97 16.0397 3.41038  
 29010.6 9406.9 11176 2025.31 292.822 38.4163 10.8417 1.97479  
 36354.6 21044.7 3097.95 1933.57 338.218 48.8276 6.40555 2.14034  
 31129.8 26613.1 8226.45 789.768 483.423 84.4779 12.1955 2.13984  
 35353.8 22628.3 9019.25 1497.13 138.948 84.9296 14.8407 2.52215  
 37375.2 25920.1 8098.39 1592.02 253.698 23.5068 14.3674 2.94154  
 42617.1 27334.7 9671.4 1782.52 341.065 54.285 5.02968 3.70986  
 49497.1 31431.3 11091.5 2312.62 414.625 79.237 12.6111 2.03897  
 36879.6 37718.5 20141 2793.48 333.089 58.0453 11.1948 2.08237  
 37100.5 28160.2 24957 6207.66 546.881 63.769 11.2011 2.57645  
 40690.8 28426.5 19681.5 10866.7 2055.08 178.916 20.9851 4.55557  
 32541.3 31173.2 19861 8907.25 3858.52 725.319 63.6335 9.1326  
 40049.8 24878.9 21300 9820.88 3856.11 1708.79 327.279 33.1297  
 37680.4 30665.9 17302.3 10185.8 3881.54 1532.02 686.815 145.709  
 42406.4 28884.4 21717.5 9293.04 4805.44 1847.63 737.3 403.257  
 29083.7 32554 20866.5 12364.8 4702.38 2439.06 944.609 587.154  
 42095.4 22327.3 23536.4 12016.5 6377.37 2435.36 1272.7 805.149

21750.5 32313.3 16111.9 13267.2 5983.76 3183.32 1224.36 1052.22  
41333.5 16689.5 23186.2 8900.22 6434.07 2912.23 1561.82 1126.47

q by index

index 1 q over time

1992 0.000128554  
1993 0.000128554  
1994 0.000128554  
1995 0.000128554  
1996 0.000128554  
1997 0.000128554  
1998 0.000128554  
1999 0.000128554  
2000 0.000128554  
2001 0.000128554  
2002 0.000128554  
2003 0.000128554  
2004 0.000128554  
2005 0.000128554  
2006 0.000128554

index 2 q over time

1992 0.000379715  
1993 0.000379715  
1994 0.000379715  
1995 0.000379715  
1996 0.000379715  
1997 0.000379715  
1998 0.000379715  
1999 0.000379715  
2000 0.000379715  
2001 0.000379715  
2002 0.000379715  
2003 0.000379715  
2004 0.000379715  
2005 0.000379715  
2006 0.000379715

index 3 q over time

1992 0.000314579  
1993 0.000314579  
1994 0.000314579  
1995 0.000314579  
1996 0.000314579  
1997 0.000314579  
1998 0.000314579  
1999 0.000314579  
2000 0.000314579  
2001 0.000314579  
2002 0.000314579  
2003 0.000314579  
2004 0.000314579  
2005 0.000314579  
2006 0.000314579

index 4 q over time

1992 0.000331277  
1993 0.000331277  
1994 0.000331277  
1995 0.000331277

1996 0.000331277  
1997 0.000331277  
1998 0.000331277  
1999 0.000331277  
2000 0.000331277  
2001 0.000331277  
2002 0.000331277  
2003 0.000331277  
2004 0.000331277  
2005 0.000331277  
2006 0.000331277

index 5 q over time

1992 0.000484419  
1993 0.000484419  
1994 0.000484419  
1996 0.000484419  
1997 0.000484419  
1998 0.000484419  
1999 0.000484419  
2000 0.000484419  
2001 0.000484419  
2002 0.000484419  
2003 0.000484419  
2004 0.000484419  
2005 0.000484419  
2006 0.000484419

index 6 q over time

1982 1.28227e-05  
1983 1.28227e-05  
1984 1.28227e-05  
1985 1.28227e-05  
1986 1.28227e-05  
1987 1.28227e-05  
1988 1.28227e-05  
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2002 1.28227e-05  
2003 1.28227e-05  
2004 1.28227e-05  
2005 1.28227e-05  
2006 1.28227e-05

index 7 q over time

1982 3.55425e-05  
1983 3.55425e-05  
1984 3.55425e-05  
1985 3.55425e-05

1986	3.55425e-05
1987	3.55425e-05
1988	3.55425e-05
1989	3.55425e-05
1990	3.55425e-05
1991	3.55425e-05
1992	3.55425e-05
1993	3.55425e-05
1994	3.55425e-05
1995	3.55425e-05
1996	3.55425e-05
1997	3.55425e-05
1998	3.55425e-05
1999	3.55425e-05
2000	3.55425e-05
2001	3.55425e-05
2002	3.55425e-05
2003	3.55425e-05
2004	3.55425e-05
2005	3.55425e-05
2006	3.55425e-05
index 8 q over time	
1982	3.0458e-05
1983	3.0458e-05
1984	3.0458e-05
1985	3.0458e-05
1986	3.0458e-05
1987	3.0458e-05
1988	3.0458e-05
1989	3.0458e-05
1990	3.0458e-05
1992	3.0458e-05
1993	3.0458e-05
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1999	3.0458e-05
2000	3.0458e-05
2001	3.0458e-05
2002	3.0458e-05
2003	3.0458e-05
2004	3.0458e-05
2005	3.0458e-05
2006	3.0458e-05
index 9 q over time	
1982	3.69596e-05
1983	3.69596e-05
1984	3.69596e-05
1985	3.69596e-05
1986	3.69596e-05
1987	3.69596e-05
1988	3.69596e-05
1989	3.69596e-05
1991	3.69596e-05
1994	3.69596e-05



1997 3.69596e-05  
1998 3.69596e-05  
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2005 3.69596e-05  
2006 3.69596e-05  
index 10 q over time  
1983 6.44512e-05  
1984 6.44512e-05  
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2003 6.44512e-05  
2004 6.44512e-05  
2005 6.44512e-05  
2006 6.44512e-05  
index 11 q over time  
1983 6.45595e-05  
1984 6.45595e-05  
1985 6.45595e-05  
1986 6.45595e-05  
1987 6.45595e-05  
1988 6.45595e-05  
1989 6.45595e-05  
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index 13 q over time

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index 14 q over time

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index 15 q over time

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index 16 q over time

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index 17 q over time  
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index 22 q over time

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index 23 q over time

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index 24 q over time

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index 25 q over time

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index 26 q over time

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index 27 q over time  
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index 30 q over time

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index 31 q over time

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index 32 q over time

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index 35 q over time  
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index 36 q over time

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index 37 q over time

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index 38 q over time

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index 39 q over time

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Proportions of catch at age by fleet

fleet 1

Year 1 Obs = 0.145346 0.527962 0.285212 0.0262759 0.00921763 0.00325989  
0.00188287 0.000843076  
Year 1 Pred = 0.0501276 0.485472 0.385065 0.0598691 0.0133905 0.00453402  
0.00120234 0.000338484  
Year 2 Obs = 0.102313 0.592534 0.235019 0.046978 0.014927 0.00695731  
0.000344634 0.000926205

Year 2 Pred = 0.0515077 0.515091 0.335066 0.0823855 0.0120416 0.00268746  
0.00090991 0.000310762  
Year 3 Obs = 0.0923461 0.514057 0.310783 0.0639504 0.0166714 0.00191047  
8.04408e-05 0.000201102  
Year 3 Pred = 0.0294064 0.553985 0.338951 0.0609848 0.0139734 0.00203737  
0.00045467 0.000207584  
Year 4 Obs = 0.0551004 0.389786 0.48609 0.0477735 0.0134101 0.0068132  
0.000811096 0.000216292  
Year 4 Pred = 0.0446351 0.406774 0.458692 0.0741354 0.0123853 0.00283055  
0.000412673 0.000134898  
Year 5 Obs = 0.0541701 0.481455 0.33418 0.114325 0.00955231 0.00423204  
0.00175327 0.000332517  
Year 5 Pred = 0.0567177 0.539261 0.296841 0.0906581 0.0136308 0.00227152  
0.000519095 0.000100926  
Year 6 Obs = 0.0342164 0.530752 0.359106 0.0546401 0.0180365 0.000828885  
0.000961507 0.00145884  
Year 6 Pred = 0.0401321 0.575437 0.323553 0.045623 0.0129078 0.0019356  
0.000322534 8.84532e-05  
Year 7 Obs = 0.019327 0.520696 0.382537 0.0562958 0.0169045 0.00318606  
0.00050029 0.000552952  
Year 7 Pred = 0.0135986 0.499142 0.411034 0.0648465 0.00853295 0.00240837  
0.000361125 7.70321e-05  
Year 8 Obs = 0.0135973 0.244752 0.573632 0.134542 0.0280693 0.00437341  
0.000715649 0.000318066  
Year 8 Pred = 0.0589844 0.261508 0.557855 0.103976 0.0150443 0.00197375  
0.000557027 0.000101825  
Year 9 Obs = 0.0381106 0.599356 0.22759 0.106817 0.0237252 0.00322061  
0.00085883 0.000322061  
Year 9 Pred = 0.0727537 0.615739 0.175262 0.113088 0.0197991 0.00285842  
0.000374988 0.000125786  
Year 10 Obs = 0.0053826 0.484685 0.447632 0.0464406 0.0135817 0.00200283  
0.000187765 8.76238e-05  
Year 10 Pred = 0.0486606 0.574966 0.32123 0.0317319 0.0194382 0.0033969  
0.000490386 8.63564e-05  
Year 11 Obs = 0.01193 0.544721 0.361714 0.068128 0.00908374 0.00423908  
0.000121116 6.2375e-05  
Year 11 Pred = 0.0570444 0.514044 0.358065 0.0610084 0.00566607 0.00346336  
0.000605194 0.000103222  
Year 12 Obs = 0.0148636 0.565594 0.372496 0.0378054 0.00484684 0.00297273  
0.00122787 0.000193874  
Year 12 Pred = 0.0551557 0.548635 0.319465 0.0647546 0.0103276 0.000956943  
0.000584885 0.0001202  
Year 13 Obs = 0.0546856 0.475376 0.397561 0.0573153 0.0123715 0.00161367  
0.000776954 0.000299127  
Year 13 Pred = 0.0549959 0.522105 0.342966 0.0651516 0.0124762 0.0019858  
0.000183991 0.000136231  
Year 14 Obs = 0.0207846 0.319422 0.53252 0.091242 0.0297887 0.00577766  
0.000375173 9.00414e-05  
Year 14 Pred = 0.0287613 0.285124 0.517332 0.137791 0.0252455 0.00484831  
0.000772906 0.000125466  
Year 15 Obs = 0.00721218 0.305647 0.549804 0.106069 0.0255535 0.00447653  
0.000994784 0.000242479  
Year 15 Pred = 0.0134081 0.217083 0.636136 0.116147 0.0141755 0.00248183  
0.000479369 8.95431e-05  
Year 16 Obs = 0.000317763 0.122736 0.576343 0.24285 0.0439307 0.0127105  
0.000794407 0.000317763

Year 16 Pred = 0.00938324 0.115482 0.632443 0.219956 0.0199016 0.00233026  
0.000409806 9.46869e-05  
Year 17 Obs = 0.00138878 0.116581 0.411079 0.383149 0.0756114 0.0106473  
0.00146594 7.71545e-05  
Year 17 Pred = 0.00922745 0.104514 0.454772 0.355379 0.0691876 0.0060533  
0.000711051 0.000155079  
Year 18 Obs = 0.000105218 0.0414558 0.426763 0.380993 0.111741 0.0324071  
0.00536611 0.00116792  
Year 18 Pred = 0.00677865 0.104288 0.438672 0.291278 0.131503 0.0249647  
0.00219746 0.000317104  
Year 19 Obs = 0 0.0624861 0.480027 0.317861 0.106896 0.0255895 0.00520717  
0.00193409  
Year 19 Pred = 0.00789122 0.0793243 0.438166 0.291966 0.118572 0.0528955  
0.0101525 0.00103283  
Year 20 Obs = 0 0.155561 0.362784 0.319844 0.115401 0.0324924 0.0108308  
0.0030863  
Year 20 Pred = 0.0073125 0.0970759 0.368907 0.321716 0.12702 0.0504645  
0.0226699 0.00483395  
Year 21 Obs = 9.43556e-05 0.0640675 0.434696 0.340718 0.119266 0.0278349  
0.0117945 0.00152856  
Year 21 Pred = 0.00721366 0.0808479 0.416407 0.265168 0.141703 0.0547542  
0.0218809 0.0120265  
Year 22 Obs = 0 0.0676562 0.371839 0.344235 0.139101 0.0496146 0.0200262  
0.00752842  
Year 22 Pred = 0.0044455 0.0819061 0.361364 0.319725 0.125718 0.0655412  
0.0254204 0.0158792  
Year 23 Obs = 0.00188235 0.041098 0.374195 0.341019 0.147294 0.0595293  
0.0232941 0.0116878  
Year 23 Pred = 0.00607367 0.0529814 0.381056 0.288777 0.158336 0.0607626  
0.0317988 0.0202156  
Year 24 Obs = 0.000249326 0.0587578 0.252733 0.332435 0.185748 0.0877627  
0.0421361 0.0401781  
Year 24 Pred = 0.00335535 0.0817784 0.276415 0.336998 0.157107 0.084024  
0.0323676 0.0279542  
Year 25 Obs = 0.000371652 0.0432045 0.378063 0.286822 0.162969 0.0790689  
0.0336345 0.0158658  
Year 25 Pred = 0.00627273 0.0417106 0.400065 0.229721 0.171729 0.0781265  
0.0419607 0.0304145  
fleet 2  
Year 1 Obs = 0.212871 0.787129 0 0 0 0 0 0  
Year 1 Pred = 0.206453 0.772093 0.0213553 9.75463e-05 6.43776e-07 6.43377e-  
09 5.03567e-11 4.18427e-13  
Year 2 Obs = 0.158085 0.841915 0 0 0 0 0 0  
Year 2 Pred = 0.202025 0.78015 0.0176966 0.000127834 5.51327e-07 3.63172e-09  
3.62926e-11 3.65846e-13  
Year 3 Obs = 0.170732 0.829268 0 0 0 0 0 0  
Year 3 Pred = 0.118613 0.862879 0.01841 9.73144e-05 6.57939e-07 2.83139e-09  
1.86498e-11 2.51317e-13  
Year 4 Obs = 0.162602 0.837398 0 0 0 0 0 0  
Year 4 Pred = 0.214676 0.755476 0.0297066 0.000141057 6.95354e-07 4.69046e-  
09 2.01836e-11 1.94737e-13  
Year 5 Obs = 0.109729 0.890271 0 0 0 0 0 0  
Year 5 Pred = 0.210855 0.774151 0.0148599 0.000133333 5.91535e-07 2.90951e-  
09 1.96246e-11 1.12617e-13  
Year 6 Obs = 0.0805471 0.919453 0 0 0 0 0 0  
Year 6 Pred = 0.150469 0.833128 0.0163352 6.76708e-05 5.64933e-07 2.50039e-  
09 1.22975e-11 9.95412e-14

Year 7 Obs = 0.0763889 0.923611 0 0 0 0 0 0  
Year 7 Pred = 0.0641732 0.909586 0.0261194 0.000121063 4.70059e-07 3.9158e-09 1.73302e-11 1.09111e-13  
Year 8 Obs = 0.303895 0.659853 0.0362514 0 0 0 0 0  
Year 8 Pred = 0.352104 0.602808 0.0448416 0.000245544 1.04833e-06 4.05941e-09 3.3814e-11 1.82442e-13  
Year 9 Obs = 0.313165 0.672856 0.0139787 0 0 0 0 0  
Year 9 Pred = 0.232493 0.759821 0.00754166 0.000142966 7.38573e-07 3.14716e-09 1.21859e-11 1.20648e-13  
Year 10 Obs = 0.172122 0.827878 0 0 0 0 0 0  
Year 10 Pred = 0.176932 0.807293 0.0157279 4.56445e-05 8.25045e-07 4.25548e-09 1.81323e-11 9.42453e-14  
Year 11 Obs = 0.341791 0.646836 0.0104987 0.000874891 0 0 0 0  
Year 11 Pred = 0.219073 0.762318 0.0185167 9.2689e-05 2.54009e-07 4.58258e-09 2.3635e-11 1.18982e-13  
Year 12 Obs = 0.237464 0.722774 0.0395405 0.000220897 0 0 0 0  
Year 12 Pred = 0.203271 0.78078 0.0158538 9.44102e-05 4.443e-07 1.21509e-09 2.19201e-11 1.32961e-13  
Year 13 Obs = 0.196259 0.67182 0.122943 0.00897756 0 0 0 0  
Year 13 Pred = 0.210509 0.771715 0.0176773 9.8657e-05 5.5746e-07 2.61886e-09 7.1618e-12 1.56513e-13  
Year 14 Obs = 0.154639 0.738519 0.0965323 0.0103093 0 0 0 0  
Year 14 Pred = 0.0859848 0.657975 0.230155 0.0238832 0.00186467 0.000129778 6.91113e-06 3.63794e-07  
Year 15 Obs = 0.0323009 0.834956 0.105752 0.0269912 0 0 0 0  
Year 15 Pred = 0.0474209 0.592638 0.334802 0.0238159 0.00123864 7.85907e-05 5.07085e-06 3.07148e-07  
Year 16 Obs = 0.0158494 0.52947 0.407628 0.047053 0 0 0 0  
Year 16 Pred = 0.0455706 0.432921 0.45708 0.0619334 0.00238795 0.000101329 5.95278e-06 4.46002e-07  
Year 17 Obs = 0.0119311 0.379585 0.483429 0.125055 0 0 0 0  
Year 17 Pred = 0.0512786 0.448323 0.376086 0.1145 0.00949923 0.000301193 1.18186e-05 8.35836e-07  
Year 18 Obs = 0.0376254 0.378344 0.467809 0.116221 0 0 0 0  
Year 18 Pred = 0.0391998 0.465521 0.377501 0.0976577 0.0187881 0.0012926 3.80077e-05 1.77851e-06  
Year 19 Obs = 0.00768693 0.262404 0.544025 0.185884 0 0 0 0  
Year 19 Pred = 0.0510138 0.395833 0.421521 0.109429 0.0189379 0.00306168 0.000196302 6.47567e-06  
Year 20 Obs = 0.00380491 0.470425 0.343826 0.176064 0.00588032 0 0 0  
Year 20 Pred = 0.0458584 0.469924 0.344277 0.116973 0.0196802 0.00283359 0.000425218 2.94015e-05  
Year 21 Obs = 0.0455251 0.356441 0.408174 0.18986 0 0 0 0  
Year 21 Pred = 0.0477635 0.413211 0.410295 0.101793 0.0231805 0.00324605 0.000433327 7.72312e-05  
Year 22 Obs = 0.0224967 0.462726 0.37715 0.110278 0.0172034 0.00441112 0.00441112 0.00132333  
Year 22 Pred = 0.0309219 0.439769 0.374049 0.128938 0.0216047 0.00408185 0.000528855 0.000107125  
Year 23 Obs = 0.0436105 0.277383 0.470588 0.182556 0.0147059 0.00456389 0.0035497 0.0030426  
Year 23 Pred = 0.0485937 0.327201 0.453685 0.133952 0.0312977 0.00435274 0.000760936 0.000156866  
Year 24 Obs = 0.100781 0.466406 0.326172 0.0828125 0.0117188 0.00507813 0.00390625 0.003125  
Year 24 Pred = 0.0254366 0.478545 0.311832 0.148118 0.0294253 0.00570324 0.000733907 0.000205534

Year 25 Obs = 0.0755703 0.285646 0.507605 0.0936312 0.019962 0.00855513  
0.00522814 0.00380228  
Year 25 Pred = 0.0538803 0.276556 0.511379 0.114402 0.0364437 0.00600855  
0.00107802 0.000253378

Proportions of Discards at age by fleet  
fleet 1

Year 1 Obs = 0 0 0 0 0 0 0  
Year 1 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 2 Obs = 0 0 0 0 0 0 0  
Year 2 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 3 Obs = 0 0 0 0 0 0 0  
Year 3 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 4 Obs = 0 0 0 0 0 0 0  
Year 4 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 5 Obs = 0 0 0 0 0 0 0  
Year 5 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 6 Obs = 0 0 0 0 0 0 0  
Year 6 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 7 Obs = 0 0 0 0 0 0 0  
Year 7 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 8 Obs = 0 0 0 0 0 0 0  
Year 8 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 9 Obs = 0 0 0 0 0 0 0  
Year 9 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 10 Obs = 0 0 0 0 0 0 0  
Year 10 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 11 Obs = 0 0 0 0 0 0 0  
Year 11 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 12 Obs = 0 0 0 0 0 0 0  
Year 12 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 13 Obs = 0 0 0 0 0 0 0  
Year 13 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 14 Obs = 0 0 0 0 0 0 0  
Year 14 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 15 Obs = 0 0 0 0 0 0 0  
Year 15 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 16 Obs = 0 0 0 0 0 0 0  
Year 16 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 17 Obs = 0 0 0 0 0 0 0  
Year 17 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 18 Obs = 0 0 0 0 0 0 0  
Year 18 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 19 Obs = 0 0 0 0 0 0 0  
Year 19 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 20 Obs = 0 0 0 0 0 0 0  
Year 20 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 21 Obs = 0 0 0 0 0 0 0  
Year 21 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 22 Obs = 0 0 0 0 0 0 0  
Year 22 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 23 Obs = 0 0 0 0 0 0 0  
Year 23 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 24 Obs = 0 0 0 0 0 0 0  
Year 24 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
Year 25 Obs = 0 0 0 0 0 0 0  
Year 25 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15



```

fleet 2
Year 1 Obs = 0 0 0 0 0 0 0 0
Year 1 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 2 Obs = 0 0 0 0 0 0 0 0
Year 2 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 3 Obs = 0 0 0 0 0 0 0 0
Year 3 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 4 Obs = 0 0 0 0 0 0 0 0
Year 4 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 5 Obs = 0 0 0 0 0 0 0 0
Year 5 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 6 Obs = 0 0 0 0 0 0 0 0
Year 6 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 7 Obs = 0 0 0 0 0 0 0 0
Year 7 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 8 Obs = 0 0 0 0 0 0 0 0
Year 8 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 9 Obs = 0 0 0 0 0 0 0 0
Year 9 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 10 Obs = 0 0 0 0 0 0 0 0
Year 10 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 11 Obs = 0 0 0 0 0 0 0 0
Year 11 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 12 Obs = 0 0 0 0 0 0 0 0
Year 12 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 13 Obs = 0 0 0 0 0 0 0 0
Year 13 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 14 Obs = 0 0 0 0 0 0 0 0
Year 14 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 15 Obs = 0 0 0 0 0 0 0 0
Year 15 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 16 Obs = 0 0 0 0 0 0 0 0
Year 16 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 17 Obs = 0 0 0 0 0 0 0 0
Year 17 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 18 Obs = 0 0 0 0 0 0 0 0
Year 18 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 19 Obs = 0 0 0 0 0 0 0 0
Year 19 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 20 Obs = 0 0 0 0 0 0 0 0
Year 20 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 21 Obs = 0 0 0 0 0 0 0 0
Year 21 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 22 Obs = 0 0 0 0 0 0 0 0
Year 22 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 23 Obs = 0 0 0 0 0 0 0 0
Year 23 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 24 Obs = 0 0 0 0 0 0 0 0
Year 24 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 25 Obs = 0 0 0 0 0 0 0 0
Year 25 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15

```

F Reference Points Using Final Year Selectivity and Freport options

refpt	F	slope to plot on SRR
F0.1	0.201379	0.481665
Fmax	0.434226	0.851622
F30%SPR	0.318992	0.668277

F40%SPR	0.213929	0.501212				
Fmsy	0.434207	0.851591	SSBmsy	46077.8	MSY	15064.7
Fcurrent	0.390494	0.78256				

Stock-Recruitment Relationship Parameters

alpha = 39239.8  
 beta = 0.416052  
 unexpl = 208922  
 steepness = 0.999992

Spawning Stock, Obs Recruits(year+1), Pred Recruits(year+1), standardized residual

init	xxxx	74147.3	39238.9	1.34719
1982	24658	82039.7	39239.2	1.5613
1983	24675.5	46771.4	39239.2	0.371725
1984	21059.6	56129.1	39239	0.757827
1985	18833.3	61947.2	39239	0.96662
1986	17757.8	47090.5	39238.9	0.386134
1987	18269.3	12802.8	39238.9	-2.37098
1988	10878.2	29010.6	39238.3	-0.639301
1989	7056.54	36354.6	39237.5	-0.161547
1990	9642.29	31129.8	39238.1	-0.490035
1991	9199.32	35353.8	39238	-0.220669
1992	10534.5	37375.2	39238.3	-0.102981
1993	12114.1	42617.1	39238.5	0.174854
1994	15155.3	49497.1	39238.7	0.491658
1995	20765.1	36879.6	39239	-0.131279
1996	23449.2	37100.5	39239.1	-0.118642
1997	24551.8	40690.8	39239.2	0.0769026
1998	27186	32541.3	39239.2	-0.396219
1999	28089.3	40049.8	39239.2	0.0432819
2000	30541.4	37680.4	39239.3	-0.0858197
2001	36127.8	42406.4	39239.4	0.164315
2002	40610.9	29083.7	39239.4	-0.634034
2003	44582.7	42095.4	39239.5	0.148725
2004	42488.8	21750.5	39239.4	-1.24909
2005	39688.9	41333.5	39239.4	0.110065
2006	40198.1	xxxx	39239.4	

Root Mean Square Error computed from Standardized Residuals

Component	#resids	RMSE
_Catch_Fleet_1	25	0.239059
_Catch_Fleet_2	25	0.0178829
Catch_Fleet_Total	50	0.169512
_Discard_Fleet_1	0	0
_Discard_Fleet_2	0	0
Discard_Fleet_Total	0	0
_Index_1	15	2.53144
_Index_2	15	1.58068
_Index_3	15	1.84289
_Index_4	15	2.38926
_Index_5	14	1.88974
_Index_6	25	1.85024
_Index_7	25	1.2775
_Index_8	24	1.86402
_Index_9	20	0.971662
_Index_10	15	1.19729
_Index_11	24	0.526106

_Index_12	24	0.997466
_Index_13	22	0.887212
_Index_14	25	1.6273
_Index_15	25	1.31531
_Index_16	24	1.02876
_Index_17	22	1.59
_Index_18	23	1.27512
_Index_19	23	1.2551
_Index_20	22	1.425
_Index_21	22	1.29857
_Index_22	22	0.93778
_Index_23	22	0.813408
_Index_24	22	1.45399
_Index_25	25	1.30423
_Index_26	20	1.57201
_Index_27	17	1.51662
_Index_28	17	1.46069
_Index_29	19	1.06949
_Index_30	19	1.59007
_Index_31	16	1.37813
_Index_32	15	1.44575
_Index_33	19	1.66748
_Index_34	25	1.05645
_Index_35	25	1.06615
_Index_36	19	1.07275
_Index_37	25	1.32323
_Index_38	21	1.56898
_Index_39	15	1.38275
Index_Total	802	1.41176
Nyear1	7	0.345998
Fmult_Year1	2	1.57647
_Fmult_devs_Fleet_1	0	0
_Fmult_devs_Fleet_2	0	0
Fmult_devs_Total	0	0
Recruit_devs	0	0
Fleet_Sel_params	12	1.8027
Index_Sel_params	0	0
q_year1	0	0
q_devs	0	0
SRR_steepness	1	-0.463037
SRR_unexpl_S	1	-2.92066

Projections not requested

that's all

## APPENDIX 5

### Full report of the 2008 assessment final model ASAP F08\_T2007\_T2 run.

Age Structured Assessment Program (ASAP) Version 2.0  
 Start time for run: Tue May 13 11:50:16 2008

obj\_fun = 4313

Component	Lambda	obj_fun
__Catch_Fleet_1	10	2098.46
__Catch_Fleet_2	10	1408.82
Catch_Fleet_Total	20	3507.28
Discard_Fleet_Total	0	0
__Index_Fit_1	1	64.0763
__Index_Fit_2	1	44.2648
__Index_Fit_3	1	30.9745
__Index_Fit_4	1	27.8193
__Index_Fit_5	1	9.71092
__Index_Fit_6	1	18.0658
__Index_Fit_7	1	3.70982
__Index_Fit_8	1	-2.52673
__Index_Fit_9	1	-47.8742
__Index_Fit_10	1	-36.6491
__Index_Fit_11	1	11.1087
__Index_Fit_12	1	-6.15912
__Index_Fit_13	1	-37.2882
__Index_Fit_14	1	27.5961
__Index_Fit_15	1	-14.232
__Index_Fit_16	1	13.7773
__Index_Fit_17	1	-21.2778
__Index_Fit_18	1	-6.5077
__Index_Fit_19	1	-33.2446
__Index_Fit_20	1	-47.0116
__Index_Fit_21	1	16.1494
__Index_Fit_22	1	1.6832
__Index_Fit_23	1	-37.15
__Index_Fit_24	1	-52.7859
__Index_Fit_25	1	10.3506
__Index_Fit_26	1	-13.1098
__Index_Fit_27	1	0.801612
__Index_Fit_28	1	12.5251
__Index_Fit_29	1	43.4257
__Index_Fit_30	1	31.987
__Index_Fit_31	1	-3.62967
__Index_Fit_32	1	-10.7252
__Index_Fit_33	1	-22.4509
__Index_Fit_34	1	21.096
__Index_Fit_35	1	79.0436
__Index_Fit_36	1	19.1408
__Index_Fit_37	1	-2.44679
__Index_Fit_38	1	-5.73109
__Index_Fit_39	1	-32.9443
Index_Fit_Total	39	53.5617
Catch_Age_Comps	see_below	666.288
Discard_Age_Comps	see_below	0
Survey_Age_Comps	see_below	0
__Sel_Param_1	1	0.866845
__Sel_Param_2	1	3.66947
__Sel_Param_3	1	1.15382
__Sel_Param_4	1	2.65425
__Sel_Param_5	1	0.926282
__Sel_Param_6	1	4.2666
__Sel_Param_7	1	1.66344
__Sel_Param_8	1	3.69603
__Sel_Param_9	1	1.25195
__Sel_Param_10	1	3.36641
__Sel_Param_11	1	1.34415
__Sel_Param_12	1	0.173468
Sel_Params_Total	12	25.0327
Index_Sel_Params_Total	0	0
q_year1_Total	0	0
q_devs_Total	390000	0
__Fmult_year1_fleet_1	1	0.608193
__Fmult_year1_fleet_2	1	0.783259
Fmult_year1_fleet_Total	2	1.39145
Fmult_devs_fleet_Total	0	0
N_year_1	1	58.6859
Recruit_devs	0	0

SRR_steepness	0.05	0.0204231
SRR_unexpl_stock	0.05	0.745703
Fmult_Max_penalty	1000	0
F_penalty	0	0

Input and Estimated effective sample sizes for fleet 1

1982	173	26.6801
1983	173	30.217
1984	173	90.0055
1985	173	302.546
1986	173	99.2317
1987	173	142.346
1988	173	435.377
1989	173	159.708
1990	173	130.282
1991	173	19.4867
1992	173	190.144
1993	173	103.484
1994	173	122.286
1995	173	140.589
1996	173	33.5065
1997	173	131.041
1998	173	291.569
1999	173	63.2269
2000	173	183.738
2001	173	154.811
2002	173	96.6285
2003	173	545.974
2004	173	245.475
2005	173	195.693
2006	173	154.771
2007	173	113.851
Total	4498	4202.67

Input and Estimated effective sample sizes for fleet 2

1982	101	507.719
1983	101	57.6236
1984	101	57.7075
1985	101	36.809
1986	101	14.8722
1987	101	22.6396
1988	101	166.708
1989	101	96.0275
1990	101	28.1179
1991	101	565.73
1992	101	13.3874
1993	101	61.784
1994	101	16.7393
1995	101	16.4124
1996	101	4.6383
1997	101	39.9822
1998	101	39.6751
1999	101	43.9303
2000	101	17.919
2001	101	130.124
2002	101	64.1021
2003	101	402.233
2004	101	85.0967
2005	101	64.3133
2006	101	157.817
2007	101	126.039
Total	2626	2838.15

Input and Estimated effective Discard sample sizes for fleet 1

1982	0	1e+15
1983	0	1e+15
1984	0	1e+15
1985	0	1e+15
1986	0	1e+15
1987	0	1e+15
1988	0	1e+15
1989	0	1e+15
1990	0	1e+15
1991	0	1e+15
1992	0	1e+15
1993	0	1e+15
1994	0	1e+15
1995	0	1e+15
1996	0	1e+15
1997	0	1e+15
1998	0	1e+15
1999	0	1e+15

```

2000 0 1e+15
2001 0 1e+15
2002 0 1e+15
2003 0 1e+15
2004 0 1e+15
2005 0 1e+15
2006 0 1e+15
2007 0 1e+15
Total 0 2.6e+16
Input and Estimated effective Discard sample sizes for fleet 2
1982 0 1e+15
1983 0 1e+15
1984 0 1e+15
1985 0 1e+15
1986 0 1e+15
1987 0 1e+15
1988 0 1e+15
1989 0 1e+15
1990 0 1e+15
1991 0 1e+15
1992 0 1e+15
1993 0 1e+15
1994 0 1e+15
1995 0 1e+15
1996 0 1e+15
1997 0 1e+15
1998 0 1e+15
1999 0 1e+15
2000 0 1e+15
2001 0 1e+15
2002 0 1e+15
2003 0 1e+15
2004 0 1e+15
2005 0 1e+15
2006 0 1e+15
2007 0 1e+15
Total 0 2.6e+16

```

Observed and predicted total fleet catch by year and standardized residual  
fleet 1 total catches

```

1982 18667 18828.6 -0.0863912
1983 26089 25464.7 0.242808
1984 25641 25371 0.106119
1985 20339 20655.7 -0.154916
1986 20289 20699.5 -0.20081
1987 17790 17787.5 0.00141991
1988 21320 20904.8 0.197175
1989 9561 9375.39 0.196527
1990 6528 6258.7 0.422331
1991 9835 9638.19 0.202643
1992 10771 10813.3 -0.0392901
1993 9720 10033 -0.317771
1994 10819 10979.1 -0.147287
1995 9436 8756.92 0.748737
1996 10314 10043.2 0.266711
1997 9376 9636.12 -0.274335
1998 10735 10947.8 -0.196812
1999 8616 8651.32 -0.0410168
2000 12555 12737.4 -0.144596
2001 10249 10378.2 -0.125586
2002 10205 10383.9 -0.17419
2003 11729 12016.2 -0.242518
2004 13060 13342.9 -0.214802
2005 12549 12585.2 -0.0288801
2006 11254 11204.9 0.0438227
2007 8934 8919.28 0.0165293

```

```

fleet 2 total catches
1982 296 296.889 -0.0300794
1983 376 376.18 -0.00480431
1984 415 414.984 0.000388468
1985 92 92.0122 -0.00132393
1986 578 578.088 -0.00152913
1987 522 521.855 0.00279191
1988 341 340.881 0.0035083
1989 754 751.981 0.0268817
1990 1448 1446.74 0.00870732
1991 1481 1481.99 -0.00672032
1992 1034 1035.91 -0.0185398
1993 1756 1757.47 -0.00840307
1994 1593 1586.56 0.0405876
1995 1060 1058.27 0.0164158

```

1996	1144	1147.56	-0.0311187
1997	881	883.006	-0.022806
1998	1123	1122.81	0.00171425
1999	2259	2251.84	0.0318083
2000	1678	1675.4	0.015565
2001	1742	1739.51	0.0143322
2002	1226	1226.57	-0.00468948
2003	1410	1412.3	-0.0163075
2004	1278	1279.45	-0.0113804
2005	1229	1227.75	0.0101849
2006	1083	1081.79	0.0111654
2007	1434	1434.04	-0.000280138

Observed and predicted total fleet Discards by year and standardized residual

fleet 1 total Discards

1982	0	0	0
1983	0	0	0
1984	0	0	0
1985	0	0	0
1986	0	0	0
1987	0	0	0
1988	0	0	0
1989	0	0	0
1990	0	0	0
1991	0	0	0
1992	0	0	0
1993	0	0	0
1994	0	0	0
1995	0	0	0
1996	0	0	0
1997	0	0	0
1998	0	0	0
1999	0	0	0
2000	0	0	0
2001	0	0	0
2002	0	0	0
2003	0	0	0
2004	0	0	0
2005	0	0	0
2006	0	0	0
2007	0	0	0

fleet 2 total Discards

1982	0	0	0
1983	0	0	0
1984	0	0	0
1985	0	0	0
1986	0	0	0
1987	0	0	0
1988	0	0	0
1989	0	0	0
1990	0	0	0
1991	0	0	0
1992	0	0	0
1993	0	0	0
1994	0	0	0
1995	0	0	0
1996	0	0	0
1997	0	0	0
1998	0	0	0
1999	0	0	0
2000	0	0	0
2001	0	0	0
2002	0	0	0
2003	0	0	0
2004	0	0	0
2005	0	0	0
2006	0	0	0
2007	0	0	0

Index data

index number 1

units = 2

month = 1

starting and ending ages for selectivity = 2 2

selectivity choice = -1

year, obs index, pred index, standardized residual

1992	7.15	2.84957	3.13375
1993	6.5	3.29769	2.31155
1994	3.76	3.43684	0.306125
1995	6.07	3.93633	1.47537
1996	22.17	4.76141	5.2398
1997	3.86	3.54155	0.293305

```

1998 1.68 3.57544 -2.57287
1999 2.11 3.92204 -2.11174
2000 0.7 3.09799 -5.06686
2001 3.07 3.80517 -0.731307
2002 2.77 3.59521 -0.888247
2003 8.17 4.08072 2.36475
2004 1.45 3.069 -2.55412
2005 2.96 4.74534 -1.60776
2006 2.64 2.32244 0.436574
2007 2.77 2.79312 -0.0283147
index number 2
units = 2
month = 1
starting and ending ages for selectivity = 3 3
selectivity choice = -1
year, obs index, pred index, standardized residual
1992 4.74 3.45418 1.07798
1993 6.7 3.05469 2.67553
1994 7.2 3.69645 2.27112
1995 4.59 4.16197 0.333466
1996 8.33 7.64029 0.294414
1997 4.8 9.49679 -2.32435
1998 3.25 7.45934 -2.83012
1999 4.8 7.54208 -1.53931
2000 6.52 8.0889 -0.734493
2001 5.33 6.49764 -0.674779
2002 10.74 8.11799 0.953443
2003 14.36 7.81897 2.07076
2004 8.68 8.87894 -0.0771934
2005 4.03 6.67258 -1.71767
2006 9.06 10.2968 -0.435894
2007 6.18 5.0958 0.657108
index number 3
units = 2
month = 1
starting and ending ages for selectivity = 4 4
selectivity choice = -1
year, obs index, pred index, standardized residual
1992 0.33 0.461835 -1.14496
1993 0.31 0.501473 -1.63843
1994 0.82 0.555506 1.32656
1995 0.25 0.722483 -3.61504
1996 0.6 0.893556 -1.35672
1997 1.04 1.94817 -2.13813
1998 2.29 3.42231 -1.36859
1999 2.9 2.81456 0.101873
2000 4.96 3.09555 1.60594
2001 6.42 3.21006 2.36111
2002 5.58 2.88469 2.24748
2003 8.48 3.81161 2.724
2004 4.56 3.70443 0.707836
2005 3.07 4.12654 -1.0075
2006 4.29 3.07693 1.13215
2007 5.15 5.05648 0.06243
index number 4
units = 2
month = 1
starting and ending ages for selectivity = 5 5
selectivity choice = -1
year, obs index, pred index, standardized residual
1992 0.04 0.0455408 -0.441913
1993 0.05 0.0830297 -1.72767
1994 0.26 0.114488 2.79402
1995 0.02 0.136193 -6.53474
1996 0.12 0.110174 0.291029
1997 0.43 0.178478 2.99536
1998 0.42 0.669946 -1.59062
1999 0.84 1.27852 -1.4309
2000 2.51 1.28225 2.28801
2001 2.44 1.28395 2.18715
2002 2.26 1.58984 1.19816
2003 2.67 1.53023 1.89624
2004 1.64 2.05439 -0.767412
2005 1.34 1.92911 -1.24128
2006 2.47 2.12562 0.511497
2007 1.54 1.74562 -0.426922
index number 5
units = 2
month = 1
starting and ending ages for selectivity = 6 8
selectivity choice = -1

```



```

year, obs index, pred index, standardized residual
1992 0.04 0.0471203 -0.558063
1993 0.04 0.0188264 2.56717
1994 0.01 0.029193 -3.64948
1996 0.03 0.0327319 -0.296878
1997 0.15 0.0343817 5.01809
1998 0.12 0.0911681 0.936047
1999 0.41 0.360765 0.435794
2000 1.08 0.948949 0.440665
2001 1.34 1.08311 0.724995
2002 1.33 1.36496 -0.088385
2003 1.96 1.81001 0.271197
2004 1.44 2.0274 -1.16539
2005 1.49 2.42386 -1.65752
2006 2.6 2.50733 0.123636
2007 1.19 2.95807 -3.10187

```

index number 6

units = 2

month = 1

starting and ending ages for selectivity = 2 2

selectivity choice = -1

```

year, obs index, pred index, standardized residual

```

```

1982 0.7 0.580534 0.485738
1983 0.32 0.695198 -2.01394
1984 0.17 0.766471 -3.90911
1985 0.55 0.436905 0.597534
1986 1.48 0.528792 2.6715
1987 0.47 0.578572 -0.539466
1988 0.6 0.442844 0.788342
1989 0.06 0.118849 -1.77419
1990 0.63 0.264453 2.25321
1991 0.79 0.339911 2.18908
1992 0.77 0.284686 2.58273
1993 0.73 0.329455 2.06514
1994 0.35 0.343358 0.0497359
1995 0.79 0.393259 1.81067
1996 1.08 0.475688 2.12835
1997 0.29 0.353818 -0.516292
1998 0.27 0.357204 -0.726496
1999 0.22 0.391831 -1.49825
2000 0.19 0.309505 -1.26657
2001 0.48 0.380155 0.605332
2002 0.34 0.359179 -0.14244
2003 0.54 0.407684 0.729591
2004 0.3 0.306608 -0.0565571
2005 0.26 0.474083 -1.55924
2006 0.04 0.232023 -4.56312
2007 0.24 0.279047 -0.391275

```

index number 7

units = 2

month = 1

starting and ending ages for selectivity = 3 3

selectivity choice = -1

```

year, obs index, pred index, standardized residual

```

```

1982 1.43 0.734744 1.72849
1983 0.39 0.758975 -1.72827
1984 0.33 0.793682 -2.27796
1985 1.56 0.825328 1.65258
1986 0.43 0.495326 -0.367113
1987 0.43 0.53146 -0.549882
1988 0.81 0.659388 0.533992
1989 0.23 0.395088 -1.40434
1990 0.03 0.109479 -3.36023
1991 0.27 0.288689 -0.173721
1992 0.41 0.322568 0.622562
1993 0.5 0.285261 1.45671
1994 0.53 0.345191 1.11298
1995 0.27 0.388664 -0.945594
1996 0.56 0.713486 -0.628744
1997 0.67 0.886855 -0.727842
1998 0.52 0.696588 -0.758891
1999 0.74 0.704315 0.128292
2000 1.03 0.755379 0.804911
2001 0.89 0.60678 0.994293
2002 0.89 0.758096 0.416381
2003 1.29 0.730172 1.47726
2004 1.45 0.829157 1.45076
2005 0.65 0.623117 0.109637
2006 1.04 0.961561 0.20355
2007 0.52 0.47587 0.230197

```

index number 8

```

units = 2
month = 1
starting and ending ages for selectivity = 4 4
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982 0.12 0.0974708 0.539746
1983 0.19 0.165977 0.350876
1984 0.09 0.126363 -0.880844
1985 0.21 0.116343 1.53293
1986 0.2 0.131329 1.09177
1987 0.02 0.064429 -3.03653
1988 0.07 0.0907741 -0.674566
1989 0.02 0.0640305 -3.02042
1990 0.06 0.0610398 -0.0445978
1992 0.01 0.0469204 -4.0126
1993 0.04 0.0509474 -0.627937
1994 0.04 0.0564369 -0.893554
1995 0.02 0.073401 -3.37494
1996 0.12 0.0907812 0.724301
1997 0.09 0.197925 -2.04562
1998 0.32 0.347691 -0.215428
1999 0.48 0.285946 1.34452
2000 0.63 0.314494 1.80337
2001 1.02 0.326128 2.95979
2002 0.74 0.293072 2.40422
2003 0.59 0.387242 1.09298
2004 0.85 0.376354 2.11473
2005 0.58 0.419238 0.842535
2006 0.24 0.312602 -0.686019
2007 1.46 0.513715 2.71126
index number 9
units = 2
month = 1
starting and ending ages for selectivity = 5 5
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982 0.02 0.0262072 -0.70162
1983 0.03 0.0294298 0.0498095
1984 0.05 0.0364831 0.818092
1985 0.04 0.0243334 1.29013
1986 0.02 0.0243703 -0.512997
1987 0.01 0.0223625 -2.08902
1988 0.02 0.0145594 0.824114
1989 0.01 0.0113938 -0.338687
1991 0.02 0.0187979 0.160902
1994 0.01 0.0135824 -0.794776
1997 0.01 0.021174 -1.94726
1998 0.06 0.0794799 -0.729804
1999 0.13 0.151679 -0.400332
2000 0.12 0.152121 -0.615657
2001 0.2 0.152322 0.706855
2002 0.31 0.188613 1.28974
2003 0.29 0.181541 1.21583
2004 0.27 0.243725 0.265754
2005 0.15 0.228863 -1.09665
2006 0.25 0.252175 -0.0224881
2007 0.57 0.207094 2.62805
index number 10
units = 2
month = 1
starting and ending ages for selectivity = 6 8
selectivity choice = -1
  year, obs index, pred index, standardized residual
1983 0.02 0.0158499 0.603673
1984 0.02 0.0115939 1.41532
1985 0.02 0.0113393 1.47294
1986 0.01 0.00883552 0.32136
1992 0.01 0.00668783 1.04424
1995 0.01 0.00624098 1.22374
1998 0.02 0.0129396 1.13028
1999 0.03 0.0512036 -1.38769
2000 0.17 0.134685 0.604433
2001 0.1 0.153727 -1.11617
2002 0.19 0.19373 -0.0504622
2003 0.2 0.256896 -0.649842
2004 0.16 0.287751 -1.52347
2005 0.17 0.34402 -1.82971
2006 0.2 0.355867 -1.49574
2007 0.46 0.419842 0.237114
index number 11
units = 2

```

```

month = 1
starting and ending ages for selectivity = 3 3
selectivity choice = -1
  year, obs index, pred index, standardized residual
1983 1.52 1.36419 0.195029
1984 1.46 1.42658 0.0417643
1985 1.39 1.48346 -0.117351
1986 0.8 0.890308 -0.192882
1987 0.83 0.955256 -0.253472
1988 0.58 1.1852 -1.28876
1989 0.62 0.710137 -0.244789
1990 0.21 0.19678 0.117256
1991 0.38 0.518894 -0.561805
1992 0.84 0.579789 0.668583
1993 1.04 0.512733 1.27539
1994 0.8 0.620453 0.458352
1995 0.67 0.698591 -0.0753595
1996 1.16 1.28243 -0.180948
1997 1.24 1.59405 -0.452947
1998 1.29 1.25206 0.0538363
1999 2.13 1.26595 0.938304
2000 1.73 1.35773 0.436971
2001 1.2 1.09064 0.17233
2002 1.36 1.36261 -0.00346277
2003 1.17 1.31242 -0.207158
2004 1.31 1.49034 -0.232597
2005 1.49 1.12 0.51477
2006 1.14 1.72833 -0.750433
2007 0.72 0.855337 -0.310623
index number 12
units = 2
month = 1
starting and ending ages for selectivity = 4 4
selectivity choice = -1
  year, obs index, pred index, standardized residual
1983 0.4 0.402302 -0.0103492
1984 0.34 0.306284 0.188332
1985 0.43 0.281997 0.760829
1986 0.46 0.318322 0.663938
1987 0.11 0.156166 -0.631975
1988 0.2 0.220022 -0.172064
1989 0.18 0.1552 0.267338
1990 0.05 0.147951 -1.95642
1991 0.03 0.0602119 -1.25637
1992 0.09 0.113728 -0.421987
1993 0.25 0.123489 1.27195
1994 0.03 0.136794 -2.73624
1995 0.09 0.177913 -1.22898
1996 0.28 0.22004 0.434583
1997 0.57 0.47974 0.310888
1998 1.14 0.84275 0.544826
1999 1.63 0.693089 1.54221
2000 1.49 0.762285 1.20865
2001 1.22 0.790484 0.782598
2002 0.93 0.710361 0.485853
2003 0.86 0.938614 -0.157746
2004 1.03 0.912223 0.218985
2005 1.37 1.01617 0.538801
2006 0.54 0.757698 -0.610835
2007 1.22 1.24517 -0.0368212
index number 13
units = 2
month = 1
starting and ending ages for selectivity = 5 5
selectivity choice = -1
  year, obs index, pred index, standardized residual
1983 0.03 0.0583056 -1.19835
1984 0.12 0.0722795 0.914228
1985 0.07 0.0482088 0.672579
1986 0.05 0.0482819 0.0630587
1987 0.11 0.044304 1.64001
1988 0.03 0.0288448 0.070814
1989 0.03 0.022573 0.512958
1991 0.04 0.0372419 0.128843
1993 0.03 0.0195152 0.775459
1994 0.01 0.0269091 -1.78513
1995 0.01 0.0320107 -2.09821
1996 0.02 0.0258951 -0.465853
1997 0.04 0.0419494 -0.0858115
1998 0.29 0.157464 1.1013
1999 0.33 0.300502 0.168867

```

```

2000 0.31 0.301378 0.050867
2001 0.4 0.301777 0.508148
2002 0.37 0.373675 -0.0178218
2003 0.35 0.359664 -0.0491171
2004 0.25 0.482861 -1.18711
2005 0.66 0.453417 0.677041
2006 0.47 0.499603 -0.110154
2007 0.35 0.410289 -0.286609
index number 14
units = 2
month = 1
starting and ending ages for selectivity = 3 3
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982 1.584 0.785839 1.26409
1983 0.599 0.811756 -0.548116
1984 0.078 0.848876 -4.30505
1985 1.26 0.882723 0.641744
1986 0.522 0.529772 -0.026653
1987 0.64 0.568419 0.213897
1988 1.005 0.705243 0.638759
1989 0.363 0.422563 -0.273997
1990 0.021 0.117093 -3.09902
1991 0.05 0.308765 -3.28316
1992 0.342 0.345 -0.0157488
1993 0.492 0.305099 0.861736
1994 1.217 0.369197 2.1511
1995 1.302 0.415692 2.05894
1996 0.686 0.763103 -0.192088
1997 1.279 0.948528 0.539072
1998 1.212 0.74503 0.877532
1999 0.878 0.753294 0.276262
2000 1.659 0.80791 1.29757
2001 1.026 0.648977 0.825996
2002 1.511 0.810815 1.12258
2003 1.44 0.78095 1.10347
2004 0.283 0.886819 -2.05981
2005 0.351 0.66645 -1.15629
2006 2.44 1.02843 1.55806
2007 0.392 0.508963 -0.470888
index number 15
units = 2
month = 1
starting and ending ages for selectivity = 4 4
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982 0.142 0.125939 0.216453
1983 0.45 0.214454 1.33658
1984 0.067 0.16327 -1.6063
1985 0.036 0.150323 -2.57752
1986 0.185 0.169687 0.15581
1987 0.013 0.083247 -3.34864
1988 0.123 0.117287 0.0857731
1989 0.102 0.082732 0.377567
1990 0.081 0.0788679 0.0481053
1991 0.012 0.032097 -1.77427
1992 0.09 0.0606245 0.712535
1993 0.065 0.0658278 -0.022822
1994 0.048 0.0729207 -0.754123
1995 0.053 0.0948395 -1.04938
1996 0.114 0.117296 -0.0514
1997 0.181 0.255734 -0.623323
1998 0.659 0.449243 0.690985
1999 1.112 0.369463 1.98708
2000 1.205 0.406349 1.96032
2001 0.73 0.421381 0.990972
2002 0.397 0.37867 0.0852473
2003 0.624 0.500345 0.398282
2004 0.323 0.486276 -0.737809
2005 1.029 0.541686 1.15715
2006 0.975 0.403904 1.58925
2007 1.008 0.663757 0.753466
index number 16
units = 2
month = 1
starting and ending ages for selectivity = 4 4
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982 0.405 0.476298 -0.29243
1983 1.662 0.811057 1.29382
1984 0.625 0.617481 0.0218269

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1985 0.267 0.568517 -1.36297
1986 1.895 0.641751 1.95266
1987 0.679 0.314837 1.38602
1988 0.663 0.443574 0.724799
1989 0.429 0.312889 0.569161
1990 0.317 0.298275 0.109799
1992 0.288 0.22928 0.411204
1993 0.186 0.248958 -0.525756
1994 0.478 0.275783 0.991854
1995 0.076 0.358679 -2.7983
1996 0.506 0.443609 0.237314
1997 1.282 0.967176 0.508187
1998 1.508 1.69902 -0.215083
1999 0.59 1.3973 -1.55483
2000 0.94 1.5368 -0.8865
2001 2.303 1.59365 0.663983
2002 1.083 1.43212 -0.503898
2003 1.302 1.89228 -0.674255
2004 1.254 1.83908 -0.690563
2005 1.455 2.04864 -0.617061
2006 2.049 1.52755 0.52963
2007 3.745 2.5103 0.721385
index number 17
units = 2
month = 1
starting and ending ages for selectivity = 5 5
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982 0.012 0.0456839 -2.41084
1983 0.02 0.0513015 -1.69877
1984 0.154 0.0635968 1.59489
1985 0.127 0.0424176 1.97763
1986 0.04 0.0424819 -0.108562
1987 0.214 0.0389819 3.07094
1988 0.011 0.0253798 -1.50773
1989 0.006 0.0198614 -2.15868
1990 0.016 0.0230425 -0.657791
1991 0.011 0.0327682 -1.96851
1992 0.006 0.00941804 -0.813087
1994 0.03 0.0236766 0.426878
1997 0.114 0.0369101 2.0337
1998 0.351 0.138548 1.67637
1999 0.262 0.264404 -0.0164685
2000 0.379 0.265175 0.644075
2001 0.494 0.265526 1.11958
2002 0.307 0.328786 -0.12364
2003 0.178 0.316458 -1.03768
2004 0.256 0.424857 -0.913549
2005 0.136 0.398949 -1.94077
2006 1.35 0.439588 2.02344
2007 0.559 0.361002 0.788557
index number 18
units = 2
month = 1
starting and ending ages for selectivity = 3 3
selectivity choice = -1
  year, obs index, pred index, standardized residual
1984 0.271 0.370923 -0.56604
1985 0.325 0.385713 -0.308864
1986 0.1 0.231488 -1.51369
1987 0.086 0.248376 -1.91266
1988 0.223 0.308162 -0.583311
1989 0.049 0.184642 -2.39237
1990 0.022 0.0511647 -1.52207
1991 0.189 0.134917 0.607894
1992 0.188 0.150751 0.398215
1993 0.151 0.133315 0.224633
1994 0.314 0.161324 1.20102
1995 0.051 0.18164 -2.29066
1996 0.266 0.333444 -0.407528
1997 0.507 0.414467 0.363412
1998 0.594 0.325547 1.08451
1999 0.593 0.329158 1.06157
2000 0.726 0.353023 1.30027
2001 0.34 0.283576 0.327252
2002 1.264 0.354292 2.29375
2003 1.016 0.341243 1.96756
2004 0.818 0.387503 1.34738
2005 0.264 0.291211 -0.176909
2006 0.36 0.449381 -0.399931
2007 0.21 0.222396 -0.103425

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index number 19
units = 2
month = 1
starting and ending ages for selectivity = 4 4
selectivity choice = -1
  year, obs index, pred index, standardized residual
1984 0.044 0.0720104 -0.888384
1985 0.04 0.0663002 -0.911273
1986 0.082 0.0748407 0.164754
1987 0.014 0.0367161 -1.73875
1988 0.035 0.0517294 -0.704543
1989 0.024 0.036489 -0.755541
1990 0.013 0.0347847 -1.77494
1991 0.029 0.0141564 1.29326
1992 0.021 0.0267385 -0.435664
1993 0.015 0.0290334 -1.19095
1994 0.025 0.0321617 -0.454273
1995 0.02 0.041829 -1.33064
1996 0.086 0.0517335 0.916557
1997 0.057 0.112792 -1.23079
1998 0.503 0.198139 1.68007
1999 0.385 0.162952 1.55053
2000 0.524 0.179221 1.9348
2001 0.365 0.18585 1.2172
2002 0.465 0.167013 1.84661
2003 0.395 0.220677 1.0499
2004 0.41 0.214472 1.16855
2005 0.15 0.238911 -0.839395
2006 0.068 0.178142 -1.73679
2007 0.56 0.292751 1.1697
index number 20
units = 2
month = 1
starting and ending ages for selectivity = 5 5
selectivity choice = -1
  year, obs index, pred index, standardized residual
1985 0.058 0.0193235 1.98214
1986 0.008 0.0193527 -1.5931
1987 0.004 0.0177583 -2.68805
1988 0.009 0.0115618 -0.451718
1989 0.016 0.00904791 1.02803
1990 0.006 0.0104971 -1.0087
1991 0.028 0.0149276 1.13431
1992 0.004 0.00429041 -0.126395
1993 0.018 0.00782226 1.50294
1994 0.018 0.0107859 0.923564
1995 0.005 0.0128308 -1.69953
1996 0.023 0.0103795 1.43489
1997 0.036 0.0168145 1.37288
1998 0.116 0.0631159 1.09757
1999 0.139 0.12045 0.25832
2000 0.074 0.120801 -0.883801
2001 0.12 0.120961 -0.0143838
2002 0.233 0.149779 0.79687
2003 0.232 0.144163 0.858032
2004 0.194 0.193545 0.00423858
2005 0.033 0.181742 -3.07672
2006 0.065 0.200255 -2.02918
2007 0.316 0.164455 1.17779
index number 21
units = 2
month = 1
starting and ending ages for selectivity = 3 3
selectivity choice = -1
  year, obs index, pred index, standardized residual
1985 0.571 0.943953 -0.906537
1986 0.339 0.566519 -0.926058
1987 1.17 0.607847 1.18092
1988 1.067 0.754162 0.625773
1989 0.884 0.451874 1.21017
1990 0.029 0.125215 -2.63787
1991 0.674 0.330182 1.28687
1992 0.826 0.36893 1.4535
1993 0.57 0.326262 1.00617
1994 0.827 0.394806 1.33344
1995 0.3 0.444527 -0.70914
1996 0.384 0.816035 -1.35942
1997 0.887 1.01432 -0.24189
1998 0.681 0.796709 -0.282999
1999 0.269 0.805546 -1.97797
2000 0.679 0.86395 -0.434424

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2001 0.395 0.693993 -1.01634
2002 2.689 0.867057 2.04111
2003 3.087 0.83512 2.35771
2004 1.459 0.948332 0.776901
2005 0.385 0.712678 -1.1105
2006 1.093 1.09977 -0.0111293
2007 0.217 0.544267 -1.65829
index number 22
units = 2
month = 1
starting and ending ages for selectivity = 4 4
selectivity choice = -1
  year, obs index, pred index, standardized residual
1985 0.331 0.375915 -0.229471
1986 0.528 0.424339 0.394155
1987 0.298 0.208177 0.646886
1988 0.223 0.2933 -0.494173
1989 0.481 0.206889 1.52149
1990 0.095 0.197226 -1.31732
1991 0.11 0.0802653 0.568324
1992 0.34 0.151604 1.45654
1993 0.366 0.164616 1.44093
1994 0.152 0.182353 -0.328336
1995 0.085 0.237166 -1.85047
1996 0.117 0.293323 -1.65749
1997 1.188 0.639517 1.11686
1998 1.373 1.12343 0.361786
1999 1.054 0.923921 0.237543
2000 1.484 1.01616 0.682957
2001 0.871 1.05375 -0.343492
2002 1.137 0.946945 0.329853
2003 1.93 1.25122 0.781592
2004 1.319 1.21604 0.146574
2005 0.755 1.3546 -1.05416
2006 0.744 1.01005 -0.551316
2007 0.592 1.65987 -1.85926
index number 23
units = 2
month = 1
starting and ending ages for selectivity = 5 5
selectivity choice = -1
  year, obs index, pred index, standardized residual
1985 0.072 0.055919 0.455827
1986 0.075 0.0560038 0.526713
1987 0.072 0.0513897 0.608152
1988 0.033 0.0334581 -0.0248605
1989 0.037 0.0261832 0.623609
1990 0.015 0.0303769 -1.27253
1991 0.042 0.0431981 -0.0507254
1992 0.036 0.0124158 1.9198
1993 0.046 0.0226364 1.27875
1994 0.039 0.0312128 0.401674
1995 0.024 0.0371303 -0.786958
1996 0.012 0.0300366 -1.65462
1997 0.042 0.0486585 -0.265379
1998 0.373 0.182647 1.28765
1999 0.321 0.348562 -0.148555
2000 0.346 0.349579 -0.0185568
2001 0.341 0.350042 -0.0471946
2002 0.436 0.433438 0.0106289
2003 0.479 0.417186 0.249171
2004 0.407 0.560087 -0.575783
2005 0.44 0.525933 -0.321724
2006 0.355 0.579507 -0.883766
2007 0.23 0.475908 -1.31132
index number 24
units = 2
month = 1
starting and ending ages for selectivity = 6 8
selectivity choice = -1
  year, obs index, pred index, standardized residual
1985 0.025 0.0119964 1.32417
1986 0.009 0.00934748 -0.0683157
1987 0.007 0.00724286 -0.0615059
1988 0.003 0.0085802 -1.89508
1989 0.003 0.003491 -0.273349
1990 0.001 0.00396183 -2.48273
1991 0.012 0.00683811 1.01422
1992 0.022 0.00707534 2.04581
1993 0.025 0.00282687 3.93085
1994 0.007 0.00438346 0.844111

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1995 0.009 0.0066026 0.558619
1996 0.005 0.00491484 0.030979
1997 0.005 0.00516257 -0.0577029
1998 0.04 0.0136893 1.9337
1999 0.075 0.0541705 0.586735
2000 0.127 0.142489 -0.20753
2001 0.191 0.162635 0.289926
2002 0.134 0.204955 -0.766351
2003 0.183 0.271781 -0.713259
2004 0.203 0.304424 -0.73076
2005 0.119 0.363953 -2.01601
2006 0.151 0.376487 -1.64758
2007 0.179 0.444169 -1.63895
index number 25
units = 2
month = 1
starting and ending ages for selectivity = 4 4
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982 1.74 0.320978 3.0482
1983 0.52 0.546572 -0.0898761
1984 0.42 0.416121 0.0167333
1985 0.49 0.383124 0.443717
1986 0.28 0.432476 -0.783999
1987 0.51 0.212169 1.58162
1988 0.37 0.298925 0.384681
1989 0.24 0.210856 0.233469
1990 0.07 0.201008 -1.9023
1991 0.12 0.0818045 0.690984
1992 0.08 0.154512 -1.18707
1993 0.41 0.167773 1.6114
1994 0.22 0.18585 0.304205
1995 0.03 0.241714 -3.76287
1996 0.2 0.298948 -0.724876
1997 1.03 0.65178 0.82524
1998 0.96 1.14497 -0.317757
1999 0.36 0.941639 -1.73399
2000 1.91 1.03565 1.10381
2001 1.24 1.07396 0.259252
2002 0.63 0.965104 -0.769172
2003 1.38 1.27521 0.142415
2004 2.08 1.23936 0.933749
2005 1.3 1.38058 -0.108451
2006 1.38 1.02942 0.528555
2007 1.13 1.6917 -0.727691
index number 26
units = 2
month = 1
starting and ending ages for selectivity = 5 5
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982 0.2 0.0576979 2.24178
1983 0.07 0.0647929 0.139401
1984 0.11 0.0803215 0.567061
1985 0.1 0.0535726 1.12555
1986 0.02 0.0536538 -1.77962
1987 0.13 0.0492334 1.75102
1988 0.02 0.0320542 -0.850647
1992 0.01 0.0118948 -0.312916
1993 0.11 0.0216865 2.92831
1994 0.07 0.0299031 1.53384
1997 0.01 0.0466168 -2.77608
1998 0.03 0.174983 -3.18026
1999 0.09 0.333937 -2.36449
2000 0.35 0.33491 0.0794755
2001 0.45 0.335354 0.530305
2002 0.3 0.415251 -0.58628
2003 0.4 0.399681 0.00143956
2004 0.49 0.536586 -0.163786
2005 0.78 0.503865 0.788052
2006 0.69 0.555191 0.392019
2007 0.44 0.455939 -0.0641716
index number 27
units = 2
month = 1
starting and ending ages for selectivity = 2 2
selectivity choice = -1
  year, obs index, pred index, standardized residual
1990 0.17 0.19741 -0.269579
1991 0.07 0.253738 -2.32241
1992 0.15 0.212514 -0.628247

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1993 0.11 0.245933 -1.45097
1994 0.08 0.256311 -2.0998
1995 0.2 0.293561 -0.692082
1996 0.41 0.355094 0.259282
1997 0.17 0.26412 -0.794579
1998 0.07 0.266647 -2.4119
1999 0.26 0.292496 -0.212382
2000 0.63 0.231041 1.80902
2001 0.42 0.28378 0.707027
2002 0.81 0.268121 1.99381
2003 1.48 0.304329 2.85239
2004 0.54 0.228878 1.54799
2005 0.55 0.353895 0.795142
2006 0.24 0.173202 0.588232
2007 0.25 0.208304 0.329051
index number 28
units = 2
month = 1
starting and ending ages for selectivity = 3 8
selectivity choice = -1
  year, obs index, pred index, standardized residual
1990 0.1 0.100368 -0.00662966
1991 0.08 0.264663 -2.15763
1992 0.18 0.295723 -0.895318
1993 0.14 0.261521 -1.12688
1994 0.05 0.316464 -3.32758
1995 0.22 0.356318 -0.869586
1996 0.53 0.654108 -0.379423
1997 0.52 0.813048 -0.806044
1998 0.36 0.638616 -1.0337
1999 0.61 0.6457 -0.102569
2000 1.89 0.692515 1.8106
2001 0.55 0.556283 -0.0204832
2002 1.11 0.695005 0.844338
2003 2.25 0.669405 2.18623
2004 1.53 0.760153 1.26147
2005 1.9 0.57126 2.16724
2006 1.08 0.881537 0.366175
2007 1.39 0.436267 2.08977
index number 29
units = 2
month = 1
starting and ending ages for selectivity = 2 2
selectivity choice = -1
  year, obs index, pred index, standardized residual
1988 3.06 5.02211 -0.89346
1989 0.51 1.34782 -1.75259
1990 1.44 2.99905 -1.32306
1991 2.69 3.85479 -0.648811
1992 3 3.22851 -0.132381
1993 5.69 3.73621 0.758571
1994 1.07 3.89387 -2.32951
1995 2.93 4.45978 -0.757596
1996 5.1 5.39458 -0.101268
1997 8.25 4.01251 1.29987
1998 5.8 4.0509 0.647269
1999 6.12 4.44359 0.577261
2000 3.91 3.50997 0.194641
2001 3.32 4.31118 -0.471129
2002 9.11 4.0733 1.45158
2003 5.61 4.62337 0.348823
2004 6.27 3.47712 1.06323
2005 5.99 5.37638 0.194904
2006 5.74 2.63128 1.40662
2007 4.1 3.16455 0.467034
index number 30
units = 2
month = 1
starting and ending ages for selectivity = 3 3
selectivity choice = -1
  year, obs index, pred index, standardized residual
1988 1.03 1.27629 -0.386641
1989 0.18 0.764718 -2.60869
1990 0.11 0.211905 -1.1824
1991 0.27 0.558776 -1.31165
1992 0.57 0.624351 -0.164246
1993 0.2 0.552141 -1.83131
1994 0.08 0.668141 -3.82763
1995 0.28 0.752284 -1.78233
1996 2.7 1.381 1.20907
1997 5.25 1.71657 2.01601

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1998 2.67 1.34829 1.23214
1999 3.46 1.36325 1.67967
2000 1.82 1.46209 0.394892
2001 1.18 1.17446 0.00848167
2002 4.13 1.46734 1.86618
2003 2.55 1.4133 1.0643
2004 2.49 1.60489 0.792098
2005 1.24 1.20608 0.050013
2006 3.22 1.86116 0.988578
2007 2.49 0.921078 1.79345
index number 31
units = 2
month = 1
starting and ending ages for selectivity = 4 4
selectivity choice = -1
  year, obs index, pred index, standardized residual
1990 0.03 0.0802986 -1.77553
1991 0.02 0.0326792 -0.885476
1992 0.06 0.0617243 -0.0510951
1993 0.01 0.0670219 -3.43082
1995 0.05 0.0965599 -1.18688
1996 0.18 0.119424 0.73989
1997 1.02 0.260373 2.46242
1998 0.29 0.457392 -0.821731
1999 0.65 0.376166 0.986348
2000 0.45 0.413721 0.151587
2001 0.41 0.429025 -0.0817988
2002 1.28 0.385539 2.16401
2003 0.57 0.509421 0.20263
2004 0.57 0.495098 0.254064
2005 0.53 0.551513 -0.0717522
2006 0.48 0.411231 0.278858
2007 1.22 0.675798 1.06528
index number 32
units = 2
month = 1
starting and ending ages for selectivity = 5 8
selectivity choice = -1
  year, obs index, pred index, standardized residual
1992 0.02 0.0115223 0.994474
1993 0.01 0.0210074 -1.33863
1994 0.02 0.0289666 -0.667996
1995 0.16 0.0344582 2.76896
1996 0.05 0.0278751 1.0537
1997 0.18 0.0451569 2.49375
1998 0.04 0.169503 -2.60408
1999 0.18 0.323479 -1.0571
2000 0.22 0.324422 -0.700466
2001 0.15 0.324852 -1.39354
2002 0.81 0.402246 1.26231
2003 0.51 0.387164 0.496945
2004 0.43 0.519782 -0.341964
2005 0.32 0.488086 -0.761335
2006 0.4 0.537804 -0.533855
2007 0.53 0.44166 0.328822
index number 33
units = 2
month = 1
starting and ending ages for selectivity = 1 1
selectivity choice = -1
  year, obs index, pred index, standardized residual
1985 0.24 0.0917319 1.73444
1986 0.172 0.101269 0.955278
1987 0.075 0.0769689 -0.046731
1988 0.015 0.0209152 -0.599493
1990 0.032 0.0600539 -1.13524
1991 0.036 0.0506361 -0.615218
1992 0.013 0.0581052 -2.70022
1993 0.084 0.060694 0.58605
1994 0.132 0.068971 1.17061
1995 0.023 0.0807101 -2.26391
1996 0.069 0.0599258 0.254275
1997 0.033 0.0602847 -1.08667
1999 0.044 0.0523443 -0.313165
2000 0.012 0.0641977 -3.02438
2001 0.021 0.0605887 -1.91084
2002 0.442 0.0686721 3.35784
2004 0.255 0.0798565 2.09379
2005 0.067 0.0390885 0.971779
2006 0.098 0.0469753 1.32611
2007 0.13 0.0651553 1.24571

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index number 34
units = 2
month = 1
starting and ending ages for selectivity = 1 1
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982 2.27 1.79398 0.424417
1983 5.01 1.99211 1.66315
1984 1.58 1.13925 0.589811
1985 1.26 1.37337 -0.155374
1986 1.26 1.51616 -0.333746
1987 0.39 1.15235 -1.9538
1988 0.54 0.313134 0.982735
1989 1.24 0.705756 1.01638
1990 2.54 0.899102 1.87286
1991 2.64 0.758103 2.25011
1992 0.89 0.869926 0.0411421
1993 0.5 0.908684 -1.07732
1994 2.41 1.0326 1.52845
1995 0.63 1.20836 -1.17454
1996 0.81 0.897184 -0.184354
1997 0.89 0.902557 -0.025267
1998 0.73 0.990054 -0.549517
1999 0.53 0.783677 -0.705339
2000 0.57 0.96114 -0.942239
2001 0.47 0.907108 -1.18578
2002 0.77 1.02813 -0.52137
2003 0.44 0.77322 -1.01673
2004 1.3 1.19558 0.151007
2005 0.35 0.585217 -0.927027
2006 0.8 0.703295 0.23234
index number 35
units = 2
month = 1
starting and ending ages for selectivity = 1 1
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982 3.408 15.5629 -2.73891
1983 17.699 17.2817 0.0430296
1984 13.31 9.88303 0.536861
1985 12.843 11.9141 0.135395
1986 59.526 13.1527 2.72272
1987 7.584 9.99666 -0.498114
1988 1.763 2.71645 -0.779621
1989 2.855 6.12248 -1.37579
1990 4.733 7.79976 -0.900852
1991 7.337 6.57659 0.197316
1992 8.487 7.54666 0.211773
1993 4.145 7.88289 -1.1592
1994 22.311 8.9579 1.64567
1995 13.067 10.4826 0.397423
1996 6.493 7.78313 -0.326833
1997 7.997 7.82974 0.0381183
1998 14.983 8.58877 1.00351
1999 8.565 6.79844 0.416564
2000 9.874 8.33795 0.304931
2001 13.543 7.86922 0.979077
2002 5.406 8.91909 -0.902926
2003 8.18 6.70773 0.357849
2004 6.993 10.3717 -0.710842
2005 2.198 5.07679 -1.50967
2006 9.658 6.10113 0.828318
2007 15.438 8.46232 1.08421
index number 36
units = 2
month = 1
starting and ending ages for selectivity = 1 1
selectivity choice = -1
  year, obs index, pred index, standardized residual
1988 0.17 0.426863 -1.66031
1989 1 0.962085 0.0697049
1990 1.28 1.22565 0.0782423
1991 1 1.03344 -0.0593244
1992 1.1 1.18588 -0.135569
1993 2.55 1.23872 1.30208
1994 1.66 1.40764 0.29738
1995 4.95 1.64723 1.98425
1996 1.66 1.22304 0.550896
1997 1.65 1.23036 0.529231
1998 0.67 1.34964 -1.26294
1999 1.03 1.06831 -0.0658515

```

```

2000 0.95 1.31022 -0.579771
2001 0.62 1.23657 -1.24501
2002 1.51 1.40154 0.134416
2003 0.6 1.05405 -1.01615
2004 0.9 1.62981 -1.07089
2005 3.11 0.797765 2.45362
2006 0.81 0.95873 -0.304005
index number 37
units = 2
month = 1
starting and ending ages for selectivity = 1 1
selectivity choice = -1
  year, obs index, pred index, standardized residual
1982 0.55 0.503709 0.158551
1983 0.96 0.559341 0.97414
1984 0.18 0.319875 -1.0369
1985 0.59 0.385612 0.766961
1986 0.39 0.425703 -0.157969
1987 0.07 0.323553 -2.76074
1988 0.06 0.087921 -0.689063
1989 0.31 0.198161 0.807002
1990 0.44 0.252448 1.00191
1991 0.76 0.212859 2.29515
1992 0.99 0.244256 2.52381
1993 0.23 0.255139 -0.18706
1994 0.75 0.289933 1.71398
1995 0.93 0.33928 1.81846
1996 0.11 0.25191 -1.49427
1997 0.17 0.253418 -0.719988
1998 0.38 0.277985 0.563744
1999 0.21 0.220039 -0.084215
2000 0.22 0.269867 -0.368434
2001 0.12 0.254696 -1.35719
2002 0.06 0.288676 -2.83305
2003 0.18 0.217103 -0.337982
2004 0.36 0.335692 0.126076
2005 0.16 0.164316 -0.0480009
2006 0.31 0.19747 0.813303
2007 0.12 0.273892 -1.48823
index number 38
units = 2
month = 1
starting and ending ages for selectivity = 1 1
selectivity choice = -1
  year, obs index, pred index, standardized residual
1986 0.32 0.288458 0.187139
1987 0.26 0.219241 0.307497
1988 0.01 0.0595756 -3.21843
1989 0.14 0.134275 0.0753021
1990 0.36 0.17106 1.34188
1991 0.38 0.144234 1.747
1992 0.37 0.165509 1.45078
1993 0.05 0.172883 -2.23726
1994 0.57 0.196459 1.92093
1995 0.3 0.229897 0.47997
1996 0.08 0.170695 -1.3667
1997 0.22 0.171717 0.446841
1998 0.39 0.188364 1.31245
1999 0.35 0.149099 1.53886
2000 0.21 0.182863 0.249537
2001 0.14 0.172583 -0.377332
2002 0.13 0.195608 -0.736824
2003 0.21 0.14711 0.641875
2004 0.27 0.227466 0.309139
2005 0.01 0.111341 -4.34618
2006 0.17 0.133806 0.431741
2007 0.17 0.18559 -0.158236
index number 39
units = 2
month = 1
starting and ending ages for selectivity = 1 1
selectivity choice = -1
  year, obs index, pred index, standardized residual
1990 0.02 0.0318227 -0.837575
1992 0.01 0.03079 -2.02809
1993 0.01 0.0321618 -2.1067
1994 0.04 0.0365478 0.16277
1995 0.03 0.0427684 -0.639483
1996 0.02 0.0317548 -0.833724
1997 0.04 0.031945 0.405518
1999 0.03 0.0277373 0.141418

```

2000	0.09	0.0340184	1.75453
2001	0.01	0.032106	-2.10357
2002	0.11	0.0363895	1.99491
2003	0.05	0.0273672	1.08686
2004	0.1	0.042316	1.55092
2005	0.04	0.0207131	1.18683
2007	0.04	0.0345259	0.265406

Input and Estimated effective sample sizes for index 1

1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
2007	0	0

Total 0 0

Input and Estimated effective sample sizes for index 2

1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
2007	0	0

Total 0 0

Input and Estimated effective sample sizes for index 3

1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
2007	0	0

Total 0 0

Input and Estimated effective sample sizes for index 4

1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
2007	0	0

Total 0 0

Input and Estimated effective sample sizes for index 5

1992	0	0
1993	0	0
1994	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
2007	0	0
Total	0	0
Input and Estimated effective sample sizes for index 6		
1982	0	0
1983	0	0
1984	0	0
1985	0	0
1986	0	0
1987	0	0
1988	0	0
1989	0	0
1990	0	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
2007	0	0
Total	0	0
Input and Estimated effective sample sizes for index 7		
1982	0	0
1983	0	0
1984	0	0
1985	0	0
1986	0	0
1987	0	0
1988	0	0
1989	0	0
1990	0	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
2007	0	0
Total	0	0
Input and Estimated effective sample sizes for index 8		
1982	0	0
1983	0	0
1984	0	0
1985	0	0
1986	0	0
1987	0	0
1988	0	0
1989	0	0

1990	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
2007	0	0
Total	0	0

Input and Estimated effective sample sizes for index 9

1982	0	0
1983	0	0
1984	0	0
1985	0	0
1986	0	0
1987	0	0
1988	0	0
1989	0	0
1991	0	0
1994	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
2007	0	0
Total	0	0

Input and Estimated effective sample sizes for index 10

1983	0	0
1984	0	0
1985	0	0
1986	0	0
1992	0	0
1995	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
2007	0	0
Total	0	0

Input and Estimated effective sample sizes for index 11

1983	0	0
1984	0	0
1985	0	0
1986	0	0
1987	0	0
1988	0	0
1989	0	0
1990	0	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0

2004	0	0
2005	0	0
2006	0	0
2007	0	0
Total	0	0

Input and Estimated effective sample sizes for index 12

1983	0	0
1984	0	0
1985	0	0
1986	0	0
1987	0	0
1988	0	0
1989	0	0
1990	0	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
2007	0	0
Total	0	0

Input and Estimated effective sample sizes for index 13

1983	0	0
1984	0	0
1985	0	0
1986	0	0
1987	0	0
1988	0	0
1989	0	0
1991	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
2007	0	0
Total	0	0

Input and Estimated effective sample sizes for index 14

1982	0	0
1983	0	0
1984	0	0
1985	0	0
1986	0	0
1987	0	0
1988	0	0
1989	0	0
1990	0	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0



2005	0	0
2006	0	0
2007	0	0
Total	0	0

Input and Estimated effective sample sizes for index 15

1982	0	0
1983	0	0
1984	0	0
1985	0	0
1986	0	0
1987	0	0
1988	0	0
1989	0	0
1990	0	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
2007	0	0
Total	0	0

Input and Estimated effective sample sizes for index 16

1982	0	0
1983	0	0
1984	0	0
1985	0	0
1986	0	0
1987	0	0
1988	0	0
1989	0	0
1990	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
2007	0	0
Total	0	0

Input and Estimated effective sample sizes for index 17

1982	0	0
1983	0	0
1984	0	0
1985	0	0
1986	0	0
1987	0	0
1988	0	0
1989	0	0
1990	0	0
1991	0	0
1992	0	0
1994	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0

2006 0 0  
 2007 0 0  
 Total 0 0  
 Input and Estimated effective sample sizes for index 18  
 1984 0 0  
 1985 0 0  
 1986 0 0  
 1987 0 0  
 1988 0 0  
 1989 0 0  
 1990 0 0  
 1991 0 0  
 1992 0 0  
 1993 0 0  
 1994 0 0  
 1995 0 0  
 1996 0 0  
 1997 0 0  
 1998 0 0  
 1999 0 0  
 2000 0 0  
 2001 0 0  
 2002 0 0  
 2003 0 0  
 2004 0 0  
 2005 0 0  
 2006 0 0  
 2007 0 0  
 Total 0 0  
 Input and Estimated effective sample sizes for index 19  
 1984 0 0  
 1985 0 0  
 1986 0 0  
 1987 0 0  
 1988 0 0  
 1989 0 0  
 1990 0 0  
 1991 0 0  
 1992 0 0  
 1993 0 0  
 1994 0 0  
 1995 0 0  
 1996 0 0  
 1997 0 0  
 1998 0 0  
 1999 0 0  
 2000 0 0  
 2001 0 0  
 2002 0 0  
 2003 0 0  
 2004 0 0  
 2005 0 0  
 2006 0 0  
 2007 0 0  
 Total 0 0  
 Input and Estimated effective sample sizes for index 20  
 1985 0 0  
 1986 0 0  
 1987 0 0  
 1988 0 0  
 1989 0 0  
 1990 0 0  
 1991 0 0  
 1992 0 0  
 1993 0 0  
 1994 0 0  
 1995 0 0  
 1996 0 0  
 1997 0 0  
 1998 0 0  
 1999 0 0  
 2000 0 0  
 2001 0 0  
 2002 0 0  
 2003 0 0  
 2004 0 0  
 2005 0 0  
 2006 0 0  
 2007 0 0  
 Total 0 0  
 Input and Estimated effective sample sizes for index 21

1985	0	0
1986	0	0
1987	0	0
1988	0	0
1989	0	0
1990	0	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
2007	0	0
Total	0	0
Input and Estimated effective sample sizes for index 22		
1985	0	0
1986	0	0
1987	0	0
1988	0	0
1989	0	0
1990	0	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
2007	0	0
Total	0	0
Input and Estimated effective sample sizes for index 23		
1985	0	0
1986	0	0
1987	0	0
1988	0	0
1989	0	0
1990	0	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
2007	0	0
Total	0	0
Input and Estimated effective sample sizes for index 24		
1985	0	0
1986	0	0
1987	0	0
1988	0	0
1989	0	0
1990	0	0

1991	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
2007	0	0
Total	0	0
Input and Estimated effective sample sizes for index 25		
1982	0	0
1983	0	0
1984	0	0
1985	0	0
1986	0	0
1987	0	0
1988	0	0
1989	0	0
1990	0	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
2007	0	0
Total	0	0
Input and Estimated effective sample sizes for index 26		
1982	0	0
1983	0	0
1984	0	0
1985	0	0
1986	0	0
1987	0	0
1988	0	0
1992	0	0
1993	0	0
1994	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
2007	0	0
Total	0	0
Input and Estimated effective sample sizes for index 27		
1990	0	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0

2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
2007	0	0
Total	0	0
Input and Estimated effective sample sizes for index 28		
1990	0	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
2007	0	0
Total	0	0
Input and Estimated effective sample sizes for index 29		
1988	0	0
1989	0	0
1990	0	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
2007	0	0
Total	0	0
Input and Estimated effective sample sizes for index 30		
1988	0	0
1989	0	0
1990	0	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
2007	0	0
Total	0	0
Input and Estimated effective sample sizes for index 31		
1990	0	0
1991	0	0
1992	0	0
1993	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0

```

1999 0 0
2000 0 0
2001 0 0
2002 0 0
2003 0 0
2004 0 0
2005 0 0
2006 0 0
2007 0 0
Total 0 0
Input and Estimated effective sample sizes for index 32
1992 0 0
1993 0 0
1994 0 0
1995 0 0
1996 0 0
1997 0 0
1998 0 0
1999 0 0
2000 0 0
2001 0 0
2002 0 0
2003 0 0
2004 0 0
2005 0 0
2006 0 0
2007 0 0
Total 0 0
Input and Estimated effective sample sizes for index 33
1985 0 0
1986 0 0
1987 0 0
1988 0 0
1990 0 0
1991 0 0
1992 0 0
1993 0 0
1994 0 0
1995 0 0
1996 0 0
1997 0 0
1999 0 0
2000 0 0
2001 0 0
2002 0 0
2004 0 0
2005 0 0
2006 0 0
2007 0 0
Total 0 0
Input and Estimated effective sample sizes for index 34
1982 0 0
1983 0 0
1984 0 0
1985 0 0
1986 0 0
1987 0 0
1988 0 0
1989 0 0
1990 0 0
1991 0 0
1992 0 0
1993 0 0
1994 0 0
1995 0 0
1996 0 0
1997 0 0
1998 0 0
1999 0 0
2000 0 0
2001 0 0
2002 0 0
2003 0 0
2004 0 0
2005 0 0
2006 0 0
Total 0 0
Input and Estimated effective sample sizes for index 35
1982 0 0
1983 0 0
1984 0 0

```

1985	0	0
1986	0	0
1987	0	0
1988	0	0
1989	0	0
1990	0	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
2007	0	0
Total	0	0
Input and Estimated effective sample sizes for index 36		
1988	0	0
1989	0	0
1990	0	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
Total	0	0
Input and Estimated effective sample sizes for index 37		
1982	0	0
1983	0	0
1984	0	0
1985	0	0
1986	0	0
1987	0	0
1988	0	0
1989	0	0
1990	0	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
2007	0	0
Total	0	0
Input and Estimated effective sample sizes for index 38		
1986	0	0
1987	0	0
1988	0	0
1989	0	0
1990	0	0
1991	0	0
1992	0	0

1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
2007	0	0
Total	0	0

Input and Estimated effective sample sizes for index 39

1990	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2007	0	0
Total	0	0

Survey proportions at age by index

Index number 1
N/A
Index number 2
N/A
Index number 3
N/A
Index number 4
N/A
Index number 5
N/A
Index number 6
N/A
Index number 7
N/A
Index number 8
N/A
Index number 9
N/A
Index number 10
N/A
Index number 11
N/A
Index number 12
N/A
Index number 13
N/A
Index number 14
N/A
Index number 15
N/A
Index number 16
N/A
Index number 17
N/A
Index number 18
N/A
Index number 19
N/A
Index number 20
N/A
Index number 21
N/A
Index number 22
N/A
Index number 23
N/A



Index number 24  
 N/A  
 Index number 25  
 N/A  
 Index number 26  
 N/A  
 Index number 27  
 N/A  
 Index number 28  
 N/A  
 Index number 29  
 N/A  
 Index number 30  
 N/A  
 Index number 31  
 N/A  
 Index number 32  
 N/A  
 Index number 33  
 N/A  
 Index number 34  
 N/A  
 Index number 35  
 N/A  
 Index number 36  
 N/A  
 Index number 37  
 N/A  
 Index number 38  
 N/A  
 Index number 39  
 N/A

Index Selectivity at Age

0 1 0 0 0 0 0 0  
 0 0 1 0 0 0 0 0  
 0 0 0 1 0 0 0 0  
 0 0 0 0 1 0 0 0  
 0 0 0 0 0 1 1 1  
 0 1 0 0 0 0 0 0  
 0 0 1 0 0 0 0 0  
 0 0 0 1 0 0 0 0  
 0 0 0 0 1 0 0 0  
 0 0 0 0 0 1 1 1  
 0 0 1 0 0 0 0 0  
 0 0 0 1 0 0 0 0  
 0 0 0 1 0 0 0 0  
 0 0 0 0 1 0 0 0  
 0 0 0 0 1 0 0 0  
 0 0 0 1 0 0 0 0  
 0 0 0 1 0 0 0 0  
 0 0 0 1 0 0 0 0  
 0 0 0 1 0 0 0 0  
 0 0 0 0 1 0 0 0  
 0 0 1 0 0 0 0 0  
 0 0 0 1 0 0 0 0  
 0 0 0 0 1 0 0 0  
 0 0 0 0 0 1 1 1  
 0 0 0 1 0 0 0 0  
 0 0 0 0 1 0 0 0  
 0 1 0 0 0 0 0 0  
 0 0 1 0 0 0 0 0  
 0 1 0 0 0 0 0 0  
 0 0 1 0 0 0 0 0  
 0 0 0 1 0 0 0 0  
 0 0 0 0 1 0 0 0  
 1 0 0 0 0 0 0 0  
 1 0 0 0 0 0 0 0  
 1 0 0 0 0 0 0 0  
 1 0 0 0 0 0 0 0  
 1 0 0 0 0 0 0 0  
 1 0 0 0 0 0 0 0  
 1 0 0 0 0 0 0 0

Deviations section: only applicable if associated lambda > 0  
 Nyear1 observed, expected, standardized residual

2	46050.8	29361.5	0.584285
3	20734.2	13655.9	0.542161
4	3070.01	3443.07	-0.148883
5	665.997	838.774	-0.299445
6	236.86	204.047	0.193589

7 61.3409 49.6362 0.27487  
8 17.4905 16.0075 0.115024

Fleet Obs, Initial, and Standardized Residual for Fmult

1 1.16363 0.9 0.333526  
2 0.0183163 0.1 -2.20359

Standardized Residuals for Fmult\_devs by fleet and year  
N/A

Index Obs, Initial, and Standardized Residual for q\_year1  
N/A

Standardized Residuals for catchability deviations by index and year

index 1 q\_devs standardized residuals

2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0

index 2 q\_devs standardized residuals

2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0

index 3 q\_devs standardized residuals

2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0

index 4 q\_devs standardized residuals

2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0

index 5 q\_devs standardized residuals

2 0  
3 0

4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
index 6 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
23 0  
24 0  
25 0  
26 0  
index 7 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
23 0  
24 0  
25 0  
26 0  
index 8 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0

18 0  
19 0  
20 0  
21 0  
22 0  
23 0  
24 0  
25 0  
index 9 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
index 10 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
index 11 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
23 0  
24 0  
25 0  
index 12 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0

12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
23 0  
24 0  
25 0  
index 13 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
23 0  
index 14 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
23 0  
24 0  
25 0  
26 0  
index 15 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0

19 0  
20 0  
21 0  
22 0  
23 0  
24 0  
25 0  
26 0  
index 16 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
23 0  
24 0  
25 0  
index 17 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
23 0  
index 18 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
23 0  
24 0  
index 19 q\_devs standardized residuals

```
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
20 0
21 0
22 0
23 0
24 0
  index 20 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
20 0
21 0
22 0
23 0
  index 21 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
20 0
21 0
22 0
23 0
  index 22 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
```

```
13 0
14 0
15 0
16 0
17 0
18 0
19 0
20 0
21 0
22 0
23 0
  index 23 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
20 0
21 0
22 0
23 0
  index 24 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
20 0
21 0
22 0
23 0
  index 25 q_devs standardized residuals
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
20 0
21 0
22 0
23 0
24 0
```



25 0  
26 0  
index 26 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
index 27 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
index 28 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
index 29 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
index 30 q\_devs standardized residuals  
2 0

3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
index 31 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
index 32 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
index 33 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
index 34 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0

11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
23 0  
24 0  
25 0  
index 35 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0  
22 0  
23 0  
24 0  
25 0  
26 0  
index 36 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
index 37 q\_devs standardized residuals  
2 0  
3 0  
4 0  
5 0  
6 0  
7 0  
8 0  
9 0  
10 0  
11 0  
12 0  
13 0  
14 0  
15 0  
16 0  
17 0  
18 0  
19 0  
20 0  
21 0







0 0 0 0 0 0 0 0  
0 0 0 0 0 0 0 0  
Total F  
0.0274542 0.505514 1.11781 1.16218 1.16359 1.16363 1.16363 1.16363  
0.0346137 0.641049 1.42295 1.47963 1.48143 1.48149 1.48149 1.48149  
0.0378661 0.699551 1.55028 1.61194 1.6139 1.61396 1.61396 1.61396  
0.0338896 0.648035 1.46821 1.52781 1.5297 1.52976 1.52976 1.52976  
0.0428304 0.768501 1.66979 1.73496 1.73703 1.73709 1.7371 1.7371  
0.0357962 0.642787 1.39739 1.45196 1.45369 1.45375 1.45375 1.45375  
0.0482335 0.887646 1.96209 2.03994 2.04242 2.04249 2.0425 2.0425  
0.061066 0.855655 1.49772 1.54236 1.54379 1.54384 1.54384 1.54384  
0.0521728 0.685851 1.11336 1.14241 1.14335 1.14338 1.14338 1.14338  
0.0588915 0.825906 1.44703 1.49023 1.49162 1.49166 1.49166 1.49166  
0.0504269 0.771518 1.47565 1.52558 1.52717 1.52722 1.52722 1.52722  
0.0526857 0.726877 1.25042 1.28665 1.28781 1.28785 1.28785 1.28785  
0.0448323 0.649592 1.1783 1.21538 1.21656 1.2166 1.2166 1.2166  
0.011714 0.17784 1.0844 1.69021 1.72717 1.71799 1.71282 1.71081  
0.00993741 0.150617 0.912408 1.42031 1.45069 1.44263 1.43814 1.4364  
0.00638572 0.0961248 0.566501 0.877017 0.89397 0.888071 0.884913 0.88369  
0.00638782 0.0946168 0.520525 0.794184 0.805153 0.797575 0.793779 0.79232  
0.00848276 0.117147 0.436395 0.59576 0.577267 0.557947 0.549392 0.546151  
0.00700041 0.100342 0.470065 0.689597 0.688597 0.676646 0.671102 0.66899  
0.00590109 0.0833053 0.357885 0.512226 0.506407 0.494939 0.489736 0.487759  
0.00446549 0.0640755 0.301895 0.44357 0.443198 0.435649 0.43214 0.430803  
0.0044524 0.0636167 0.292886 0.427642 0.426217 0.418394 0.414784 0.41341  
0.00446183 0.0643719 0.312106 0.462039 0.463024 0.455861 0.452499 0.451217  
0.00460458 0.0663596 0.319939 0.472946 0.473683 0.466212 0.462714 0.461379  
0.00385766 0.0552277 0.257024 0.37639 0.375579 0.36892 0.365837 0.364662  
0.00466635 0.0640468 0.228205 0.30638 0.294669 0.283611 0.278741 0.276897

Average F for ages 4 to 8

Preprint unweighted in .std and MCMC files

year	unweighted	Nweighted	Bweighted
1982	1.16333	1.16252	1.16265
1983	1.48111	1.47992	1.4801
1984	1.61354	1.61237	1.61254
1985	1.52936	1.52814	1.52834
1986	1.73665	1.73528	1.73547
1987	1.45338	1.45239	1.45262
1988	2.04197	2.04031	2.04056
1989	1.54353	1.54257	1.54269
1990	1.14318	1.14257	1.14263
1991	1.49137	1.49082	1.49098
1992	1.52688	1.5258	1.52595
1993	1.2876	1.28683	1.28689
1994	1.21635	1.2156	1.21574
1995	1.7118	1.69649	1.70048
1996	1.43763	1.42387	1.42552
1997	0.885532	0.878462	0.879351
1998	0.796603	0.79591	0.796504
1999	0.565303	0.588346	0.585278
2000	0.678987	0.687564	0.685809
2001	0.498213	0.508154	0.505515
2002	0.437072	0.441841	0.440267
2003	0.420089	0.425298	0.423423
2004	0.456928	0.460772	0.45932
2005	0.467387	0.471316	0.469727
2006	0.370278	0.373876	0.37208
2007	0.28806	0.298373	0.29348

Population Numbers at the Start of the Year

73512 46050.8 20734.2 3070.01 665.997 236.86 61.3409 17.4905  
81631 55146.6 21418 5227.72 747.893 162.016 57.6182 19.2191  
46683 60800.3 22397.4 3980.02 927.138 132.4 28.6803 13.636  
56276.8 34657.5 23290.5 3664.41 618.38 143.768 20.5296 6.58269  
62127.7 41946.4 13977.9 4136.45 619.317 104.314 24.2506 4.58442  
47219.8 45895.3 14997.6 2029.3 568.293 84.9096 14.3007 3.9594  
12831.3 35128.6 18607.7 2859.09 369.996 103.435 15.4536 3.33059  
28919.9 9427.72 11149.2 2016.75 289.547 37.3777 10.4484 1.90085  
36842.6 20977.8 3089.47 1922.55 335.923 48.1598 6.21669 2.05712  
31064.9 26963.4 8146.69 782.425 477.706 83.3903 11.955 2.05898  
35647 22582.7 9102.75 1477.84 137.3 83.7118 14.6124 2.45928  
37235.3 26134.1 8049.96 1604.68 250.324 23.2195 14.1563 2.89113  
42313.1 27236.8 9741.18 1777.58 345.166 53.7822 4.98854 3.66875  
49515 31195.2 10968 2311.89 410.604 79.6358 12.408 2.00582  
36764 37734 20134.3 2859.31 332.159 56.8526 11.1281 2.028  
36984.2 28066.6 25026.7 6234 538.089 60.6381 10.4628 2.4365  
40569.5 28335.2 19657.5 10951.1 2019.8 171.409 19.4307 4.15534  
32112.8 31082 19875.5 9006.37 3854.57 703.172 60.1282 8.32199  
39384.7 24551.5 21316.5 9905.53 3865.81 1685.38 313.455 30.8252  
37170.7 30155.8 17123.1 10272 3870.93 1512.21 667.208 137.201

42129.8 28491.9 21393.2 9230.8 4793.17 1816.82 717.944 384.685  
31684.3 32339.5 20605.2 12196.8 4613.45 2396.46 915.248 559.633  
48991.3 24321.7 23398.5 11853.9 6193.72 2346.11 1228.26 761.949  
23980.5 37606.6 17584.1 13204.6 5816.03 3035.91 1158.24 990.124  
28819 18405.2 27134.9 9845.93 6408.47 2820.56 1483.34 1058.9  
39972.2 22135.4 13428.9 16180.3 5262.82 3428.22 1518.94 1379.72

q by index  
index 1 q over time  
1992 0.000126184  
1993 0.000126184  
1994 0.000126184  
1995 0.000126184  
1996 0.000126184  
1997 0.000126184  
1998 0.000126184  
1999 0.000126184  
2000 0.000126184  
2001 0.000126184  
2002 0.000126184  
2003 0.000126184  
2004 0.000126184  
2005 0.000126184  
2006 0.000126184  
2007 0.000126184  
index 2 q over time  
1992 0.000379466  
1993 0.000379466  
1994 0.000379466  
1995 0.000379466  
1996 0.000379466  
1997 0.000379466  
1998 0.000379466  
1999 0.000379466  
2000 0.000379466  
2001 0.000379466  
2002 0.000379466  
2003 0.000379466  
2004 0.000379466  
2005 0.000379466  
2006 0.000379466  
2007 0.000379466  
index 3 q over time  
1992 0.000312507  
1993 0.000312507  
1994 0.000312507  
1995 0.000312507  
1996 0.000312507  
1997 0.000312507  
1998 0.000312507  
1999 0.000312507  
2000 0.000312507  
2001 0.000312507  
2002 0.000312507  
2003 0.000312507  
2004 0.000312507  
2005 0.000312507  
2006 0.000312507  
2007 0.000312507  
index 4 q over time  
1992 0.000331689  
1993 0.000331689  
1994 0.000331689  
1995 0.000331689  
1996 0.000331689  
1997 0.000331689  
1998 0.000331689  
1999 0.000331689  
2000 0.000331689  
2001 0.000331689  
2002 0.000331689  
2003 0.000331689  
2004 0.000331689  
2005 0.000331689  
2006 0.000331689  
2007 0.000331689  
index 5 q over time  
1992 0.00046754  
1993 0.00046754  
1994 0.00046754  
1996 0.00046754



1997 0.00046754  
1998 0.00046754  
1999 0.00046754  
2000 0.00046754  
2001 0.00046754  
2002 0.00046754  
2003 0.00046754  
2004 0.00046754  
2005 0.00046754  
2006 0.00046754  
2007 0.00046754  
index 6 q over time  
1982 1.26064e-05  
1983 1.26064e-05  
1984 1.26064e-05  
1985 1.26064e-05  
1986 1.26064e-05  
1987 1.26064e-05  
1988 1.26064e-05  
1989 1.26064e-05  
1990 1.26064e-05  
1991 1.26064e-05  
1992 1.26064e-05  
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Proportions of catch at age by fleet

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  fleet 1
Year 1 Obs = 0.145346 0.527962 0.285212 0.0262759 0.00921763 0.00325989 0.00188287 0.000843076
Year 1 Pred = 0.049384 0.484434 0.388235 0.0590498 0.0128191 0.00455918 0.00118072 0.000337968
Year 2 Obs = 0.102313 0.592534 0.235019 0.046978 0.014927 0.00695731 0.000344634 0.000926205

```

Year 2 Pred = 0.0512962 0.513578 0.335489 0.0838069 0.0119968 0.00259892 0.000924261 0.000309417  
Year 3 Obs = 0.0923461 0.514057 0.310783 0.0639504 0.0166714 0.00191047 8.04408e-05 0.000201102  
Year 3 Pred = 0.029454 0.555468 0.336931 0.0611951 0.0142633 0.0020369 0.000441231 0.000210525  
Year 4 Obs = 0.0551004 0.389786 0.48609 0.0477735 0.0134101 0.0068132 0.000811096 0.000216292  
Year 4 Pred = 0.0449956 0.409313 0.456434 0.0734316 0.0123989 0.00288268 0.000411637 0.000132464  
Year 5 Obs = 0.0541701 0.481455 0.33418 0.114325 0.00955231 0.00423204 0.00175327 0.000332517  
Year 5 Pred = 0.0570858 0.543498 0.294286 0.0889418 0.0133237 0.00224419 0.000521726 9.89693e-05  
Year 6 Obs = 0.0342164 0.530752 0.359106 0.0546401 0.0180365 0.000828885 0.000961507 0.00145884  
Year 6 Pred = 0.0402038 0.579018 0.321478 0.0445493 0.0124835 0.00186521 0.000314144 8.72942e-05  
Year 7 Obs = 0.019327 0.520696 0.382537 0.0562958 0.0169045 0.00318606 0.00050029 0.000552952  
Year 7 Pred = 0.0135933 0.500978 0.4102 0.0641755 0.00830871 0.0023228 0.000347035 7.50363e-05  
Year 8 Obs = 0.0135973 0.244752 0.573632 0.134542 0.0280693 0.00437341 0.000715649 0.000318066  
Year 8 Pred = 0.0588184 0.263107 0.557039 0.103595 0.0148843 0.00192146 0.000537117 9.80668e-05  
Year 9 Obs = 0.0381106 0.599356 0.22759 0.106817 0.0237252 0.00322061 0.00085883 0.000322061  
Year 9 Pred = 0.0737869 0.616048 0.174801 0.112403 0.0196574 0.00281827 0.000363796 0.000120849  
Year 10 Obs = 0.0053826 0.484685 0.447632 0.0464406 0.0135817 0.00200283 0.000187765 8.76238e-05  
Year 10 Pred = 0.0482566 0.581195 0.316317 0.0312466 0.0190918 0.00333282 0.000477798 8.25889e-05  
Year 11 Obs = 0.01193 0.544721 0.361714 0.068128 0.00908374 0.00423908 0.000121116 6.2375e-05  
Year 11 Pred = 0.0572646 0.512767 0.360273 0.0600185 0.00557985 0.00340211 0.000593862  
0.000100307  
Year 12 Obs = 0.0148636 0.565594 0.372496 0.0378054 0.00484684 0.00297273 0.00122787  
0.000193874  
Year 12 Pred = 0.0545833 0.552266 0.316366 0.0650029 0.0101485 0.000941374 0.00057393  
0.000117656  
Year 13 Obs = 0.0546856 0.475376 0.397561 0.0573153 0.0123715 0.00161367 0.000776954  
0.000299127  
Year 13 Pred = 0.0545465 0.520998 0.344764 0.0648166 0.012596 0.0019627 0.000182049 0.000134398  
Year 14 Obs = 0.0207846 0.319422 0.53252 0.091242 0.0297887 0.00577766 0.000375173 9.00414e-05  
Year 14 Pred = 0.0294113 0.279512 0.517242 0.14206 0.0258257 0.00503527 0.000786042 0.000127598  
Year 15 Obs = 0.00721218 0.305647 0.549804 0.106069 0.0255535 0.00447653 0.000994784  
0.000242479  
Year 15 Pred = 0.0136392 0.213678 0.634513 0.120741 0.0143812 0.00247393 0.00048509 8.87848e-05  
Year 16 Obs = 0.000317763 0.122736 0.576343 0.24285 0.0439307 0.0127105 0.000794407 0.000317763  
Year 16 Pred = 0.00950554 0.112759 0.630338 0.224686 0.0199686 0.00226042 0.000390575 9.13718e-05  
Year 17 Obs = 0.00138878 0.116581 0.411079 0.383149 0.0756114 0.0106473 0.00146594 7.71545e-05  
Year 17 Pred = 0.00928427 0.101434 0.449723 0.363622 0.0692166 0.00590483 0.000670494  
0.000144073  
Year 18 Obs = 0.000105218 0.0414558 0.426763 0.380993 0.111741 0.0324071 0.00536611 0.00116792  
Year 18 Pred = 0.00673953 0.101067 0.433126 0.298525 0.133522 0.0246137 0.00211279 0.000294108  
Year 19 Obs = 0 0.0624861 0.480027 0.317861 0.106896 0.0255895 0.00520717 0.00193409  
Year 19 Pred = 0.0078247 0.0761177 0.432957 0.298404 0.120791 0.0530394 0.0098889 0.0009775  
Year 20 Obs = 0 0.155561 0.362784 0.319844 0.115401 0.0324924 0.0108308 0.0030863  
Year 20 Pred = 0.007309 0.0932291 0.361614 0.330361 0.129402 0.0509129 0.0225174 0.00465481  
Year 21 Obs = 9.43556e-05 0.0640675 0.434696 0.340718 0.119266 0.0278349 0.0117945 0.00152856  
Year 21 Pred = 0.00732134 0.0785039 0.409216 0.270232 0.145504 0.055453 0.0219498 0.0118205  
Year 22 Obs = 0 0.0676562 0.371839 0.344235 0.139101 0.0496146 0.0200262 0.00752842  
Year 22 Pred = 0.00495905 0.080269 0.356434 0.323863 0.127086 0.0663836 0.0253968 0.015608  
Year 23 Obs = 0.00188235 0.041098 0.374195 0.341019 0.147294 0.0595293 0.0232941 0.0116878  
Year 23 Pred = 0.00719677 0.0566396 0.376594 0.290958 0.157549 0.0599921 0.0314581 0.0196128  
Year 24 Obs = 0.000249326 0.0587578 0.252733 0.332435 0.185748 0.0877627 0.0421361 0.0401781  
Year 24 Pred = 0.00361273 0.0897368 0.289239 0.330823 0.151021 0.0792574 0.0302879 0.0260219  
Year 25 Obs = 0.000371652 0.0432045 0.378063 0.286822 0.162969 0.0790689 0.0336345 0.0158658  
Year 25 Pred = 0.00400102 0.0406719 0.423098 0.237199 0.160122 0.0708334 0.0373076 0.0267667  
Year 26 Obs = 0.000251762 0.0304632 0.183661 0.454431 0.194361 0.0813192 0.0342397 0.0212739  
Year 26 Pred = 0.00571511 0.0501845 0.218591 0.414476 0.140515 0.0921871 0.040941 0.0373903  
fleet 2  
Year 1 Obs = 0.212871 0.787129 0 0 0 0 0  
Year 1 Pred = 0.204666 0.773764 0.0214714 9.74591e-05 6.34572e-07 6.77087e-09 5.26067e-11  
4.51762e-13  
Year 2 Obs = 0.158085 0.841915 0 0 0 0 0  
Year 2 Pred = 0.20216 0.780064 0.0176439 0.000131533 5.64727e-07 3.67029e-09 3.91598e-11  
3.93304e-13  
Year 3 Obs = 0.170732 0.829268 0 0 0 0 0  
Year 3 Pred = 0.118741 0.863034 0.018126 9.82463e-05 6.86811e-07 2.94254e-09 1.9123e-11  
2.73737e-13  
Year 4 Obs = 0.162602 0.837398 0 0 0 0 0  
Year 4 Pred = 0.215428 0.755269 0.0291619 0.00014001 7.0905e-07 4.94568e-09 2.11876e-11  
2.04552e-13  
Year 5 Obs = 0.109729 0.890271 0 0 0 0 0  
Year 5 Pred = 0.211027 0.774324 0.0145173 0.000130937 5.883e-07 2.97281e-09 2.07343e-11  
1.18001e-13  
Year 6 Obs = 0.0805471 0.919453 0 0 0 0 0  
Year 6 Pred = 0.150201 0.833705 0.0160274 6.62812e-05 5.57063e-07 2.49707e-09 1.26174e-11  
1.05188e-13  
Year 7 Obs = 0.0763889 0.923611 0 0 0 0 0  
Year 7 Pred = 0.0640677 0.910012 0.0257998 0.000120456 4.67747e-07 3.92304e-09 1.75842e-11  
1.14067e-13  
Year 8 Obs = 0.303895 0.659853 0.0362514 0 0 0 0

Year 8 Pred = 0.350746 0.604679 0.0443273 0.000246016 1.06016e-06 4.10589e-09 3.44338e-11  
 1.88615e-13  
 Year 9 Obs = 0.313165 0.672856 0.0139787 0 0 0 0  
 Year 9 Pred = 0.235297 0.757121 0.00743854 0.000142744 7.4873e-07 3.22045e-09 1.24718e-11  
 1.24295e-13  
 Year 10 Obs = 0.172122 0.827878 0 0 0 0 0  
 Year 10 Pred = 0.174537 0.81015 0.0152672 4.50066e-05 8.24783e-07 4.31955e-09 1.85785e-11  
 9.63442e-14  
 Year 11 Obs = 0.341791 0.646836 0.0104987 0.000874891 0 0 0 0  
 Year 11 Pred = 0.220488 0.760909 0.0185113 9.20295e-05 2.56616e-07 4.69401e-09 2.45821e-11  
 1.24568e-13  
 Year 12 Obs = 0.237464 0.722774 0.0395405 0.000220897 0 0 0 0  
 Year 12 Pred = 0.200914 0.783451 0.0155398 9.52854e-05 4.46184e-07 1.24168e-09 2.27114e-11  
 1.39681e-13  
 Year 13 Obs = 0.196259 0.67182 0.122943 0.00897756 0 0 0 0  
 Year 13 Pred = 0.209821 0.772382 0.0176974 9.92915e-05 5.78732e-07 2.70541e-09 7.52846e-12  
 1.66744e-13  
 Year 14 Obs = 0.154639 0.738519 0.0965323 0.0103093 0 0 0 0  
 Year 14 Pred = 0.0877395 0.650955 0.234019 0.0250301 0.00208387 0.000162421 9.36956e-06  
 5.44356e-07  
 Year 15 Obs = 0.0323009 0.834956 0.105752 0.0269912 0 0 0 0  
 Year 15 Pred = 0.0479861 0.586889 0.338566 0.0250893 0.00136855 9.41135e-05 6.81931e-06  
 4.46706e-07  
 Year 16 Obs = 0.0158494 0.52947 0.407628 0.047053 0 0 0 0  
 Year 16 Pred = 0.0459273 0.425322 0.461897 0.0641178 0.00260963 0.000118093 7.54035e-06  
 6.31342e-07  
 Year 17 Obs = 0.0119311 0.379585 0.483429 0.125055 0 0 0 0  
 Year 17 Pred = 0.0515527 0.439702 0.378727 0.119251 0.0103957 0.000354529 1.48762e-05 1.14405e-06  
 06  
 Year 18 Obs = 0.0376254 0.378344 0.467809 0.116221 0 0 0 0  
 Year 18 Pred = 0.0389912 0.456477 0.38004 0.102006 0.0208943 0.00153976 4.88412e-05 2.43334e-06  
 Year 19 Obs = 0.00768693 0.262404 0.544025 0.185884 0 0 0 0  
 Year 19 Pred = 0.0506725 0.384823 0.425233 0.114135 0.0211581 0.00371401 0.000255885 9.05273e-06  
 Year 20 Obs = 0.00380491 0.470425 0.343826 0.176064 0.00588032 0 0 0  
 Year 20 Pred = 0.0460866 0.458922 0.345811 0.123031 0.0220696 0.00347124 0.00056732 4.19736e-05  
 Year 21 Obs = 0.0455251 0.356441 0.408174 0.18986 0 0 0  
 Year 21 Pred = 0.0483991 0.405143 0.410276 0.105509 0.0260171 0.0039638 0.000579789 0.000111748  
 Year 22 Obs = 0.0224967 0.462726 0.37715 0.110278 0.0172034 0.00441112 0.00441112 0.00132333  
 Year 22 Pred = 0.0341796 0.431904 0.372586 0.131838 0.0236921 0.00494732 0.000699424 0.000153842  
 Year 23 Obs = 0.0436105 0.277383 0.470588 0.182556 0.0147059 0.00456389 0.0035497 0.0030426  
 Year 23 Pred = 0.0550307 0.33811 0.436735 0.131403 0.0325852 0.00496022 0.000961154 0.000214469  
 Year 24 Obs = 0.100781 0.466406 0.326172 0.0828125 0.0117188 0.00507813 0.00390625 0.003125  
 Year 24 Pred = 0.0254107 0.492744 0.308542 0.137431 0.0287314 0.00602782 0.000851221 0.000261744  
 Year 25 Obs = 0.0755703 0.285646 0.507605 0.0936312 0.019962 0.00855513 0.00522814 0.00380228  
 Year 25 Pred = 0.0335615 0.26634 0.538258 0.117515 0.0363296 0.00642465 0.00125044 0.000321088  
 Year 26 Obs = 0.0476397 0.301429 0.326548 0.263317 0.044175 0.0103941 0.00476397 0.00173235  
 Year 26 Pred = 0.0531444 0.364312 0.308278 0.227636 0.0353423 0.00926922 0.00152119 0.000497222

Proportions of Discards at age by fleet

fleet 1  
 Year 1 Obs = 0 0 0 0 0 0 0  
 Year 1 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 2 Obs = 0 0 0 0 0 0 0  
 Year 2 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 3 Obs = 0 0 0 0 0 0 0  
 Year 3 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 4 Obs = 0 0 0 0 0 0 0  
 Year 4 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 5 Obs = 0 0 0 0 0 0 0  
 Year 5 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 6 Obs = 0 0 0 0 0 0 0  
 Year 6 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 7 Obs = 0 0 0 0 0 0 0  
 Year 7 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 8 Obs = 0 0 0 0 0 0 0  
 Year 8 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 9 Obs = 0 0 0 0 0 0 0  
 Year 9 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 10 Obs = 0 0 0 0 0 0 0  
 Year 10 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 11 Obs = 0 0 0 0 0 0 0  
 Year 11 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 12 Obs = 0 0 0 0 0 0 0  
 Year 12 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 13 Obs = 0 0 0 0 0 0 0  
 Year 13 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 14 Obs = 0 0 0 0 0 0 0  
 Year 14 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 15 Obs = 0 0 0 0 0 0 0  
 Year 15 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15  
 Year 16 Obs = 0 0 0 0 0 0 0

```

Year 16 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 17 Obs = 0 0 0 0 0 0 0 0
Year 17 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 18 Obs = 0 0 0 0 0 0 0 0
Year 18 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 19 Obs = 0 0 0 0 0 0 0 0
Year 19 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 20 Obs = 0 0 0 0 0 0 0 0
Year 20 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 21 Obs = 0 0 0 0 0 0 0 0
Year 21 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 22 Obs = 0 0 0 0 0 0 0 0
Year 22 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 23 Obs = 0 0 0 0 0 0 0 0
Year 23 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 24 Obs = 0 0 0 0 0 0 0 0
Year 24 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 25 Obs = 0 0 0 0 0 0 0 0
Year 25 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 26 Obs = 0 0 0 0 0 0 0 0
Year 26 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
fleet 2
Year 1 Obs = 0 0 0 0 0 0 0 0
Year 1 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 2 Obs = 0 0 0 0 0 0 0 0
Year 2 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 3 Obs = 0 0 0 0 0 0 0 0
Year 3 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 4 Obs = 0 0 0 0 0 0 0 0
Year 4 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 5 Obs = 0 0 0 0 0 0 0 0
Year 5 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 6 Obs = 0 0 0 0 0 0 0 0
Year 6 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 7 Obs = 0 0 0 0 0 0 0 0
Year 7 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 8 Obs = 0 0 0 0 0 0 0 0
Year 8 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 9 Obs = 0 0 0 0 0 0 0 0
Year 9 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 10 Obs = 0 0 0 0 0 0 0 0
Year 10 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 11 Obs = 0 0 0 0 0 0 0 0
Year 11 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 12 Obs = 0 0 0 0 0 0 0 0
Year 12 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 13 Obs = 0 0 0 0 0 0 0 0
Year 13 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 14 Obs = 0 0 0 0 0 0 0 0
Year 14 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 15 Obs = 0 0 0 0 0 0 0 0
Year 15 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 16 Obs = 0 0 0 0 0 0 0 0
Year 16 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 17 Obs = 0 0 0 0 0 0 0 0
Year 17 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 18 Obs = 0 0 0 0 0 0 0 0
Year 18 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 19 Obs = 0 0 0 0 0 0 0 0
Year 19 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 20 Obs = 0 0 0 0 0 0 0 0
Year 20 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 21 Obs = 0 0 0 0 0 0 0 0
Year 21 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 22 Obs = 0 0 0 0 0 0 0 0
Year 22 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 23 Obs = 0 0 0 0 0 0 0 0
Year 23 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 24 Obs = 0 0 0 0 0 0 0 0
Year 24 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 25 Obs = 0 0 0 0 0 0 0 0
Year 25 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15
Year 26 Obs = 0 0 0 0 0 0 0 0
Year 26 Pred = 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15 1e-15

```

```

F Reference Points Using Final Year Selectivity and Freport options
refpt      F      slope to plot on SRR
F0.1      0.201454    0.506501
Fmax      0.419999    0.891641
F30%SPR   0.305528    0.687652
F40%SPR   0.206915    0.515744

```

Fmsy 0.419984 0.891614 SSBmsy 43898.1 MSY 14686.3  
 Fcurrent 0.28806 0.656698

Stock-Recruitment Relationship Parameters

alpha = 39140.3  
 beta = 0.260441  
 unexpl = 208427  
 steepness = 0.999995

Spawning Stock, Obs Recruits(year+1), Pred Recruits(year+1), standardized residual

Year	Spawning Stock	Obs Recruits	Pred Recruits	Standardized Residual
init	xxxx	73512	39139.8	1.33433
1982	24674.1	81631	39139.9	1.55609
1983	24637.2	46683	39139.9	0.373083
1984	20983.9	56276.8	39139.9	0.768746
1985	18724.4	62127.7	39139.8	0.978135
1986	17691.4	47219.8	39139.8	0.397293
1987	18338.1	12831.3	39139.8	-2.36092
1988	10860.9	28919.9	39139.4	-0.640588
1989	7016.68	36842.6	39138.9	-0.127994
1990	9576.14	31064.9	39139.3	-0.489117
1991	9151.69	35647	39139.2	-0.197847
1992	10535.6	37235.3	39139.4	-0.105578
1993	12098.5	42313.1	39139.5	0.165048
1994	15053.4	49515	39139.7	0.497774
1995	20670.9	36764	39139.9	-0.132567
1996	23326.5	36984.2	39139.9	-0.119928
1997	24649.9	40569.5	39139.9	0.0759434
1998	27654.2	32112.8	39140	-0.418919
1999	28054.4	39384.7	39140	0.0131966
2000	30320.6	37170.7	39140	-0.109287
2001	35650.5	42129.8	39140.1	0.155825
2002	40412	31684.3	39140.1	-0.447363
2003	43672.8	48991.3	39140.1	0.475241
2004	43932.2	23980.5	39140.1	-1.0371
2005	42080.6	28819	39140.1	-0.648022
2006	41671.3	39972.2	39140.1	0.044534
2007	43363.2	xxxx	39140.1	

Root Mean Square Error computed from Standardized Residuals

Component	#resids	RMSE
_Catch_Fleet_1	26	0.239034
_Catch_Fleet_2	26	0.0172357
Catch_Fleet_Total	52	0.169462
_Discard_Fleet_1	0	0
_Discard_Fleet_2	0	0
Discard_Fleet_Total	0	0
_Index_1	16	2.47416
_Index_2	16	1.56581
_Index_3	16	1.7774
_Index_4	16	2.30417
_Index_5	15	2.01824
_Index_6	26	1.84718
_Index_7	26	1.24458
_Index_8	25	1.90547
_Index_9	21	1.10394
_Index_10	16	1.12998
_Index_11	25	0.52376
_Index_12	25	0.974942
_Index_13	23	0.874376
_Index_14	26	1.58857
_Index_15	26	1.27939
_Index_16	25	1.01676
_Index_17	23	1.55624
_Index_18	24	1.25105
_Index_19	24	1.25697
_Index_20	23	1.40824
_Index_21	23	1.32506
_Index_22	23	1.00765
_Index_23	23	0.845876
_Index_24	23	1.45351
_Index_25	26	1.28712
_Index_26	21	1.53474
_Index_27	18	1.46784
_Index_28	18	1.49051
_Index_29	20	1.02325
_Index_30	20	1.59283
_Index_31	17	1.35936
_Index_32	16	1.40278
_Index_33	20	1.64523
_Index_34	25	1.05951
_Index_35	26	1.09205
_Index_36	19	1.04855

_Index_37	26	1.33618
_Index_38	22	1.55052
_Index_39	15	1.34453
Index_Total	838	1.4048
Nyear1	7	0.353234
Fmult_Year1	2	1.57592
_Fmult_devs_Fleet_1	0	0
_Fmult_devs_Fleet_2	0	0
Fmult_devs_Total	0	0
Recruit_devs	0	0
Fleet_Sel_params	12	1.79915
Index_Sel_params	0	0
q_year1	0	0
q_devs	0	0
SRR_steepness	1	-0.463041
SRR_unexpl_S	1	-2.91758

Projections not requested

that's all

## APPENDIX 6

### SAW 47 Working Paper 11 (TOR 6) – Modeling Environmental Factors

September 5, 2007

#### Modeling environmental factors and summer flounder recruitment success

by  
Mark Terceiro  
NOAA Fisheries NEFSC  
166 Water St.  
Woods Hole, MA 02543

A Report to the Northeast Regional (NER) Stock Assessment Workshop (SAW)  
Southern Demersal Working Group (SDWG)

### INTRODUCTION

There is interest among scientists, managers, and fishermen in exploring the relationship between environmental processes and summer flounder recruitment. Such processes might include the influence of physical parameters such as water temperature and salinity, and biological ones such as the density of prey (e.g., zooplankton and small fish) or the density of predators (e.g., spiny dogfish, bluefish, or striped bass). The most recent stock assessments for summer flounder (Terceiro 2006a, b; SDWG 2007) indicate that over the last 25 years recruitment has varied annually by a factor of about seven (Table 1, Figure 1). The weak year class that recruited to the stock in 2005, which was spawned by the largest spawning stock biomass (SSB) of summer flounder since the 1970s, brought increased focus to the influence of environmental factors on the success of summer flounder recruitment.

Evidence from several studies suggests that low water temperatures could negatively impact summer flounder recruitment. Summer flounder spawning occurs during an annual offshore migration from coastal areas to the continental shelf from August through December, and is generally considered to peak around November 1 (O'Brien et al. 1993). Summer flounder eggs have been collected as early as September in the northern Mid-Atlantic Bight and as late as January off Cape Hatteras, NC, with peak egg concentrations in October and November (Smith 1973, Able et al. 1990). Summer flounder eggs in the wild are tolerant to a wide range of temperatures between about 9 and 22°C, with most occurring in temperatures of about 13-17°C (Smith 1973). Summer flounder larvae have been collected over an even wider range of temperatures (0-23°C; Smith 1973). Laboratory studies suggest that summer flounder eggs and larvae are tolerant to relatively high temperatures (Johns and Howell 1980, Johns et al. 1981),



but that both eggs and larvae are susceptible to shock exposure to low temperatures of about 0°C (Hoss et al. 1974).

Summer flounder larvae undergo metamorphosis during the late autumn and early winter months as they enter the estuarine zone along the mid-Atlantic coast (Able et al. 1990). Szedlmayer et al. (1992) investigated the first year growth and effects of water temperature on survival for summer flounder juveniles migrating into New Jersey estuaries in the winter of 1988-1989, and found that the survival of metamorphosing larvae decreased drastically when water temperatures dropped below 2°C. Keefe and Able (1992) found that the survival of metamorphosing larvae was lower at laboratory water temperatures of 4°C than at 10°C, and concluded that estuarine summer flounder larvae suffer increased mortality based on both the duration and severity of cold water temperatures. Malloy and Targett (1991) conducted laboratory experiments on juvenile summer flounder and found 100% survival above 3°C, suggesting that the juveniles were able to survive most winter water temperatures encountered in the Mid-Atlantic Bight. However, Malloy and Targett (1994) found 42% mortality of juveniles at 2°C and concluded that mortality in the wild from acute exposure to low water temperatures probably occurred during one 2 to 4 week period each winter, and that summer flounder recruitment success in the north/central Mid-Atlantic Bight may be lower in years with late winter cold periods due to increased exposure to lethal temperatures.

Over the last decade, persistent significant relationships have been found between environmental factors and recruitment success for a variety of fish species around the world. Daskalov (1999) used General Additive Modeling (GAM; Hastie and Tibshirani 1990) to document significant correlations between the recruitment success of Black Sea anchovy, whiting, sprat, and horse mackerel and environmental factors including sea surface temperature, wind speed, wind stress, mixing, atmospheric pressure, and river run-off. Williams and Quinn (2000) used correlation analyses to identify significant environmental factors affecting Pacific herring recruitment success. Beentjes and Renwick (2001) used correlation analysis to identify a significant relationship between New Zealand red cod recruitment success and sea surface temperature. Chen and Ware (1999), Chen et al. (2000), Chen (2001), and Dreyfus-Leon and Chen (2007) used neural network, fuzzy logic, and genetic algorithm models to explore the relationships between environmental factors and recruitment success of Pacific herring stocks. Megrey et al. (2005) examined the utility of linear and non-linear regression, Generalized Additive Models (GAMs), and Artificial Neural Network (ANN) models in identifying relationships between recruitment and the environment for both simulated and real Norwegian herring stock-recruit data. Brodziak and O'Brien (2005) used randomization methods and the GAM approach to evaluate the response of New England groundfish recruit-spawner ratios to environmental variables such as the North Atlantic Oscillation (NAO) index, water temperature, windstress, and shelf water volume anomalies. This work explores the relationships between water temperature anomalies, NAO indices and metrics of summer flounder recruitment success by applying some of the approaches of Brodziak and O'Brien (2005) and Megrey et al. (2005) to summer flounder spawner-recruit data and relevant environmental data.

## **DATA AND MODELING APPROACH**

### *Data*

Spawning stock biomass (SSB) and recruitment estimates (VPA0) for summer flounder were taken from a version of the 2007 assessment update Virtual Population Analysis (VPA)

F07\_ALL sensitivity run (includes all available survey indices; SDWG 2007), which has historically exhibited a milder retrospective pattern and more precise estimates of stock size (a “degrees of freedom” phenomenon) than the F07\_1 final run used to determine the official status of the stock. Because no accepted parametric stock-recruit relationship was available (Terceiro 2006b), the RSAs were computed as the difference between the observed annual RS ratio values and the mean RS ratio value for the 1983-2006 year classes (Table 1, Figure 1).

NEFSC research survey surface and bottom water temperature anomalies for the Mid-Atlantic Bight North (MABN; Nantucket Shoals to Hudson Canyon) and South regions (MABS; Hudson Canyon to Cape Hatteras) were obtained from the NEFSC database (<http://www.nefsc.noaa.gov/epd/ocean/MainPage/ioos>) following the methods developed by Mountain (2004). Seasonal temperatures anomalies were computed for the two regions for winter/spring (season 1; January-June) and fall (July-December) for both surface and bottom water temperatures (Figure 2). Fall season anomalies are forward lagged to the next calendar year for correspondence with summer flounder age-0 year class designation (because summer flounder are born during September-March, and appear in fishery and research survey catches from 9-16 months after birth, a fish spawned in fall 1990 by the 1990 SSB may not appear in fishery and catches until late fall/early winter 1991 – but it is classified as a age 0 fish even though it may be up to 15 months old, since the abundance of the year class is estimated as of January 1, 1991).

North Atlantic Oscillation (NAO) climate index monthly values were obtained from the University of East Anglia database (<http://www.cru.uea.ac.uk/cru/climon/monthly>) and winter (December-March) and fall (September- November) indices were computed as per Jones et al. (1997)(Figure 3). NAO indices were also forward lagged one and two years because the NAO can produce both contemporary local and time-lagged broad-scale physical changes in the climate that could influence recruitment success (Brodziak and O'Brien 2005).

### *Modeling Approach*

The works cited in the Introduction set the foundation for the hypothesis that relatively cold water temperature, or some mechanism associated with cold and/or severe weather, is correlated with poor recruitment success for summer flounder. Aspects of the current work follow the general approach of Brodziak and O'Brien (2005), who examined relationships between environmental indices and summer flounder Recruit-Spawner Anomalies (RSAs), considered a measure of summer flounder recruitment success that is independent of the size of the Spawning Stock Biomass (SSB). Brodziak and O'Brien (2005) found that the NAO2 index (NAO winter index forward lagged by two years) was a significant predictor of summer flounder RS ratios, with positive NAO anomalies (wet and mild winters) correlating with positive RSAs (high recruit survival rate). This work also follows aspects of the work of Megrey et al. (2005), by considering the absolute estimates of recruitment (VPA0) as another measure of recruitment success, which may or may not be subject to strong influence of the magnitude of SSB.

Correlation analyses among the environmental factors and RSAs and absolute estimates of recruitment (VPA0) were performed first to identify potentially significant relationships. The GAM approach to modeling (Hastie and Tibshirani 1990), suggested by Daskalov (1999), Megrey et al. (2005), and Brodziak and O'Brien (2005) as an effective tool for modeling biological responses to environmental factors, was then used to model relationships for environmental (predictive) factors initially identified by the correlation analysis as significant at the  $p = 0.10$  level. The GAM approach is a nonparametric regression technique that relaxes error

distribution assumptions in modeling the relationships between independent predictive variables and dependent response variables. The initial null predictive model in the GAM framework used smoothing splines with 3 degrees of freedom for each predictive factor. Following the procedures suggested by Brodziak and O'Brien (2005), a stepwise model-selection process was applied to eliminate predictive factors from the model if they had a  $p$ -value  $\leq 0.20$ , with the step repeated until only predictive factors with  $p \leq 0.20$  were included in the model. Finally, the time series of the environmental factors with best fitting GAM models were used in an exercise to investigate their performance as potential VPA recruitment calibration indices.

## RESULTS AND DISCUSSION

The most prominent features of the summer flounder absolute recruitment series (VPA0) are the strong year class that recruited in 1983, and the two weak year classes that recruited in 1988 and 2005 (Table 1, Figure 1). The most prominent features of the summer flounder recruit-spawner anomaly (RSA) series are the generally positive anomalies before 1996, and the uniformly negative anomalies since. The strong negative RSAs in 1988 and 2005 correspond to the weak absolute magnitude of recruitments (VPA0) in those years. The pattern of relatively low (negative) RSA since 1995 is one that would be expected for a fish stock exhibiting a Beverton-Holt (1957) asymptotic stock-recruitment relationship as that stock grows toward  $SSB_{MSY}$  (Terceiro 2006b).

Visual inspection of the temperature anomaly and climate index series indicates a few instances of prominent environmental factors that correspond with the metrics of recruitment success. For example, a) the relatively high MAS\_ST2 and MAS\_BT2 (Mid-Atlantic South region Fall surface and bottom) temperature anomalies in 1983 correlate with the strong 1983 year class (VPA0) and positive 1983 RSA, b) the negative MAS\_BT2 anomaly correlates with the weak 2005 year class and negative 2005 RSA, and c) the slightly negative MAS\_ST1 anomaly in 1988 is the strongest correlate with the weak 1998 year class/negative 1988 RSA (Figure 2). For the NAO climate indices, the unlagged positive NAO\_WIN climate indices in the early 1990s correlate with the positive RSAs during that period; the positive 1983 NAO\_FAL index correlates with the strong 1983 year class and positive 1983 RSA (Figure 3). The lagged NAO indices likewise have a positive correspondence with positive RSAs in the early 1990s (Figures 3-4), but do not appear to correlate strongly with any of the prominent recruitment success features (i.e., 1983, 1998, or 2005 year classes or RSAs).

Several of the regional, seasonal temperature anomalies exhibit significant statistical correlation over the time series. The strongest positive correlations were between annual values of the Mid-Atlantic North region winter-spring surface (MAN\_ST1) and bottom (MAN\_BT1) anomalies ( $r = 0.50$ ) and the MAN\_BT1 and MAS\_BT2 ( $r = 0.57$ ) anomalies, both significant at the  $p = 0.01$  level. None of the correlations between NAO indices were significant at the  $p = 0.10$  level. The strongest relationships between temperature anomalies and NAO indices were negative correlations between the MAN\_BT1 anomaly and NAO\_WIN index ( $r = -0.42$ ;  $p = 0.03$ ) and the MAS\_ST1 anomaly and the NAO\_FAL index ( $r = -0.41$ ;  $p = 0.04$ ).

The strongest statistical correlations between the metrics of recruitment success and environmental factors (Table 2) were between the RSA and the NAO\_WIN index ( $r = 0.59$ ;  $p < 0.01$ ), the RSA and the MAN\_BT1 anomaly ( $r = -0.43$ ;  $p = 0.04$ ), the VPA0 and the MAS\_BT2 anomaly ( $r = 0.38$ ;  $p = 0.08$ ), the VPA0 and the NAO\_FAL\_1 index ( $r = 0.35$ ;  $p = 0.09$ ), and the VPA0 and the NAO\_FAL index ( $r = 0.34$ ;  $p = 0.09$ ). Correlations of this magnitude are of about

the same statistical significance as the highest correlations between the F07\_ALL absolute recruitment estimates (VPA0) and research survey VPA calibration indices (e.g., MDDNR  $r = 0.53$ ,  $p < 0.01$ ; CTDEP  $r = 0.45$ ,  $p = 0.03$ ; RIDFW  $r = 0.35$ ,  $p = 0.09$ ; VIMS  $r = 0.34$ ,  $p = 0.09$ ; NEFSC  $r = 0.33$ ,  $p = 0.10$ ; SDWG 2007).

Based on the combined results of the correlation analyses, the initial GAMs related either absolute recruitment (VPA0) or recruitment survival rate (RSA) to the MAN\_BT1 and MAS\_BT2 temperature anomalies and the NAO\_FAL, NAO\_FAL\_1, and NAO\_WIN climate indices. The final GAM relating RSA to the predictive factors included only the NAO\_WIN index (i.e.,  $p \leq 0.20$ ). The estimated effect of the NAO\_WIN index (predictive factor; x-axis) on summer flounder recruit-spawner anomaly (RSA; y-axis) is presented in Table 3 and Figure 4 (GAM 1). Comparison of the observed NAO\_WIN index and estimated RSA indicates a positive and fairly strong predicative relationship, in line with the results of the correlation analysis (Figure 4, bottom panel).

The final GAM relating VPA0 to the predictive environmental factors included the MAS\_BT2 temperature anomaly and the NAO\_WIN and NAO\_FAL\_1 climate indices (i.e.,  $p \leq 0.20$ ). Note that the NAO\_WIN index emerged as a significant predictive factor for VPA0 in the GAM model, even though the correlation of this factor with VPA0 was not initially identified as significant ( $r = 0.08$ ,  $p = 0.72$ ). Also, the NAO\_FAL index failed to be retained in the GAM (i.e.,  $p > 0.20$ ), even though NAO\_FAL was significantly correlated with VPA0 ( $r = 0.34$ ,  $p = 0.09$ ). The estimated combined effects of these predictive factors (x-axis) on the absolute magnitude of summer flounder recruitment (VPA0; y-axis) are presented in Table 3 and in the first panel of Figure 5 (GAM2). The combined predictive fit characterizes the strong 1983 year class and the weak 1988 and 2005 year classes relatively well. However, the subsequent panels of Figure 5 demonstrate that the relationship between VPA0 and the individual environmental factors is relatively weak as evidenced by the wide confidence intervals of the predicted VPA0.

The time series of the predictive factors from the GAM2 model (NAO\_WIN, NAO\_FAL\_1 and MAS\_BT2) were included as indices of age 0 recruitment (VPA0) in three derivative configurations of the summer flounder ADAPT VPA F07\_ALL run to investigate their performance as potential calibration indices (i.e., as proxy indices of recruitment). Summary diagnostics for runs F07\_ALL (all available survey indices included), F07\_ALL\_GAM2 (same as F07\_ALL, but including environmental factors MAS\_BT2, NAO\_WIN, and NAO\_FAL\_1 as recruitment calibration indices), F07\_GAM2\_ONLY (including only the environmental factors MAS\_BT2, NAO\_WIN, and NAO\_FAL\_1 as recruitment calibration indices), and F07\_MD0\_MAS\_BT2 (including only the MD DNR age 0 survey index [the best correlated trawl survey index with estimates from run F07\_ALL] and the environmental factor MAS\_BT2 [the best correlated environmental factor with estimates from run F07\_ALL] as recruitment calibration indices) are presented in Table 4.

The inclusion of the environmental factors as recruitment calibration indices degraded the overall fit of the VPA, as diagnosed by increases in the magnitude of the MSR for the alternative runs (MSR = Mean Squared Residual = total sum of squared residuals divided by degrees of freedom). Estimates of the strong 1983 and weak 1988 year classes, estimated in the converged (stabilized) part of the VPA, were unchanged by the inclusion of the environmental factors. Estimates of the weak 2005 year class increased by up to 30% in the alternative runs; estimates of the average 2006 year class increased by up to 13% in the alternative runs.

In summary, the results of this work suggest there are relationships between commonly measured environmental factors such as regional water temperature anomalies and larger scale

climate indices and metrics of summer flounder recruitment success. However, these relationships are no stronger than those currently modeled using research survey indices of abundance. Inclusion of these environmental factors in alternative configurations of the current summer flounder assessment VPA does not significantly change the pattern of the recruitment time series or increase the precision of current recruitment estimates. The inclusion of the environmental factors in other summer flounder population dynamics models would not be expected to improve the reliability of forecasts or biological reference points.

Finally, it should be noted that a value of the NAO\_WIN index for the 2006-2007 winter season (Dec. 2006-Mar 2007: NAO\_WIN = 1.83) is available to use in the GAM1 model to predict the RSA for 2007 = 0.78; given the estimate of the SSB that will produce the 2007 year class (44.451 kmt), this predicted RSA equates to predicted recruitment in 2007 of 34.7 million fish – about 2% below the F07\_ALL VPA time series average of 35.4 million fish. Since the fall NAO and temperature anomaly data are lagged forward, environmental factor data are also available to fit the GAM2 model to predict the 2007 VPA0 (NAO\_FAL\_1 = -0.43; MAS\_BT2 = 1.205). The GAM2 model predicted 2007 value for VPA0 in 2007 is 50.4 million fish – about 42% above the F07\_ALL VPA time series average of 35.4 million fish.

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Table 1. Summer flounder Spawning Stock Biomass (SSB; 000s metric tons), recruitment at age 0 (VPA0; million of fish), Recruit-Spawner ratios (RS), and Recruit-Spawner Anomalies (RSA), from the SDWG (2007) F07\_ALL VPA run configuration. Note that estimates differ from the SDWG (2007) F07\_1 VPA run used for official status determination.

Year	SSB	VPA0	RS	RSA
1983	22.582	80.3	3.556	1.552
1984	24.435	48.4	1.981	-0.025
1985	21.870	48.6	2.222	0.216
1986	19.853	53.4	2.690	0.687
1987	18.391	43.9	2.387	0.383
1988	19.082	13.0	0.681	-1.322
1989	10.883	27.3	2.508	0.501
1990	7.025	30.4	4.327	2.316
1991	9.940	28.7	2.887	0.881
1992	8.743	32.3	3.694	1.691
1993	9.905	33.2	3.352	1.343
1994	12.287	35.3	2.873	0.864
1995	15.099	38.7	2.563	0.557
1996	18.972	28.3	1.492	-0.515
1997	20.065	28.0	1.395	-0.560
1998	20.381	31.3	1.536	-0.469
1999	22.141	30.0	1.355	-0.650
2000	22.491	33.7	1.498	-0.505
2001	25.940	36.8	1.419	-0.585
2002	32.145	39.6	1.232	-0.774
2003	38.879	28.0	0.720	-1.284
2004	45.873	36.1	0.787	-1.218
2005	46.451	12.2	0.263	-1.742
2006	47.956	32.2	0.671	-1.334
Mean	22.558	35.4	2.004	0.000

Table 2. Significant correlations of environmental factors with metrics of summer flounder recruitment success. See text for meaning of acronyms; Spearman  $r$  is a correlation coefficient;  $p$  level indicates probability that correlation ( $r$ ) is due to random chance.

Recruitment metric	Environmental Factor	Spearman $r$	$p$
RSA (Recruit-Spawner Anomaly)	NAO_WIN	0.59	<0.01
	MAN_BT1	-0.43	0.04
VPA0 (age 0 stock size)	NAO_FAL	0.34	0.09
	NAO_FAL_1	0.35	0.09
	MAS_BT2	0.38	0.08



Table 3. Summary General Additive Model (GAM) results for relationship between environmental factors and summer flounder recruitment metrics with significant linear model component fits ( $p < 0.20$ ).

**Regression model using NAO\_WIN and RSA**

<b>Parameter Estimates</b>				
Parameter	Parameter Estimate	Standard Error	t Value	Pr >  t
Intercept	-0.36404	0.21224	-1.72	0.1018
Linear(NAO_WIN)	0.52255	0.15453	3.38	0.0030

<b>Fit Summary for Smoothing Components</b>				
Component	Smoothing Parameter	DF	GCV	Num Unique Obs
Spline(NAO_WIN)	0.990281	3.000000	0.959966	24

**Regression model using NAO\_WIN, NAO\_FAL\_1, MAS\_BT2 and VPA0**

<b>Parameter Estimates</b>				
Parameter	Parameter Estimate	Standard Error	t Value	Pr >  t
Intercept	32.30060	3.15681	10.23	<.0001
Linear(NAO_WIN)	5.56656	1.91828	2.90	0.0124
Linear(NAO_FAL_1)	4.57488	2.82983	1.62	0.1299
Linear(MAS_BT2)	4.02419	1.87632	2.14	0.0514

<b>Fit Summary for Smoothing Components</b>				
Component	Smoothing Parameter	DF	GCV	Num Unique Obs
Spline(NAO_WIN)	0.988675	3.000000	99.148877	23
Spline(NAO_FAL_1)	0.978174	3.000000	99.276403	19
Spline(MAS_BT2)	0.989486	3.000000	99.148669	23

Table 4. Summary diagnostics for summer flounder ADAPT VPA runs F07\_ALL (all available survey indices included), F07\_ALL\_GAM2 (same as F07\_ALL, but including environmental factors MAS\_BT2, NAO\_WIN, and NAO\_FAL\_1 as age 0 calibration indices), F07\_GAM2\_ONLY (including only the environmental factors MAS\_BT2, NAO\_WIN, and NAO\_FAL\_1 as age 0 calibration indices), and F07\_MD0\_MAS\_BT2 (including only the MD DNR age 0 survey index and the environmental factor MAS\_BT2 as age 0 calibration indices). MSR = Mean Squared Residual. Age 0 (recruitment) stock sizes (VPA0) in thousands of fish.

Run ID	MSR	Age 0 1983 N	Age 0 1988 N	Age 0 2005 N	Age 0 2006 N
F07_ALL	0.846	80,323	13,033	12,209	33,167
F07_ALL_GAM2	0.943	80,323	13,033	13,432	34,419
F07_GAM2_ONLY	1.017	80,323	13,033	15,912	35,185
F07_MD0_MAS_BT2	0.924	80,323	13,033	13,479	36,225

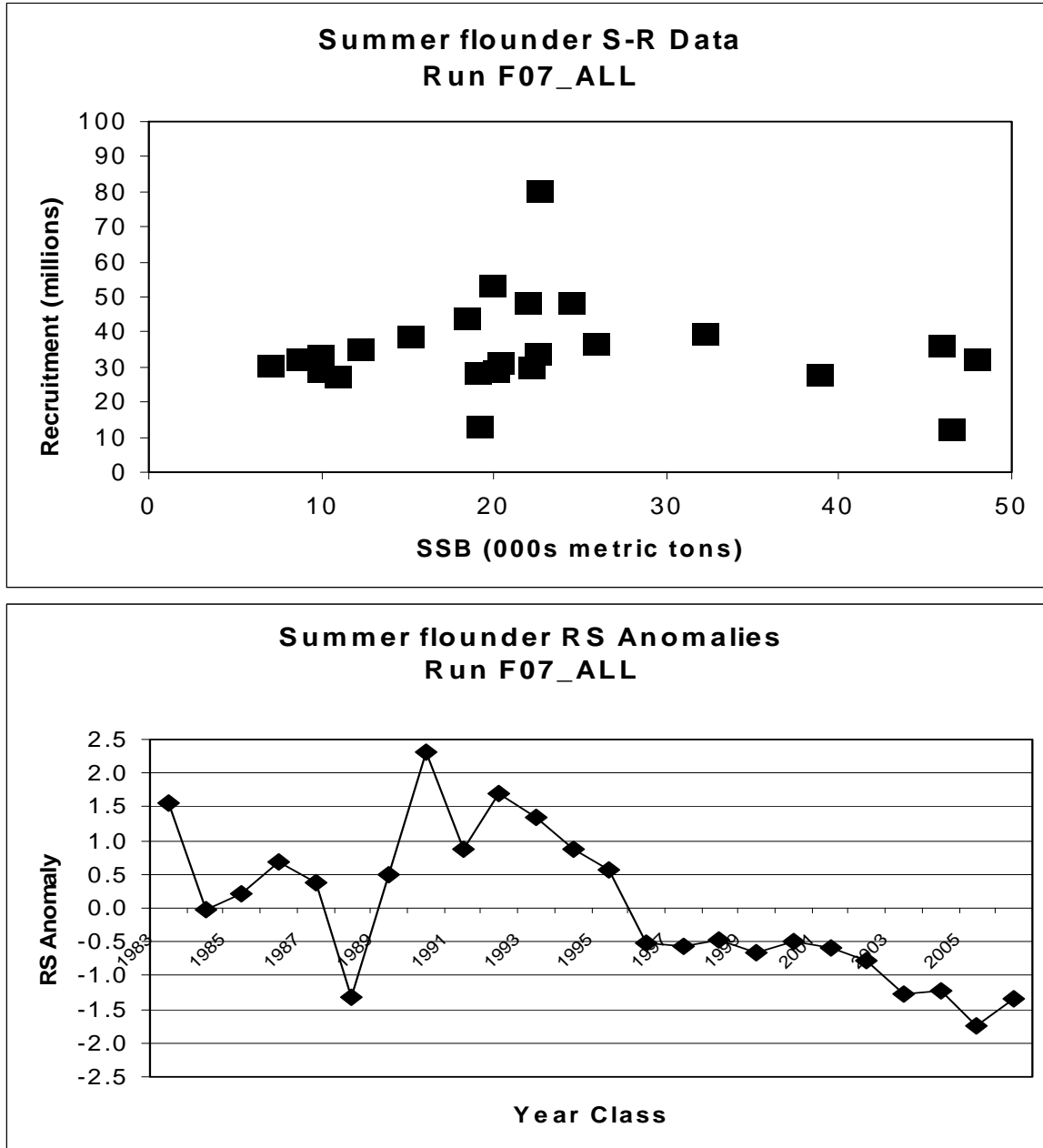


Figure 1. Summer flounder Spawning Stock Biomass (SSB; 000s metric tons) and Recruitment (Age 0 fish; millions) estimates (top) and Recruit-Spawner Anomalies (RSA; bottom) from the SDWG (2007) F07\_ALL VPA run for the 1983-2006 year classes. Note that estimates differ from the SDWG (2007) F07\_1 VPA run used for official status determination.

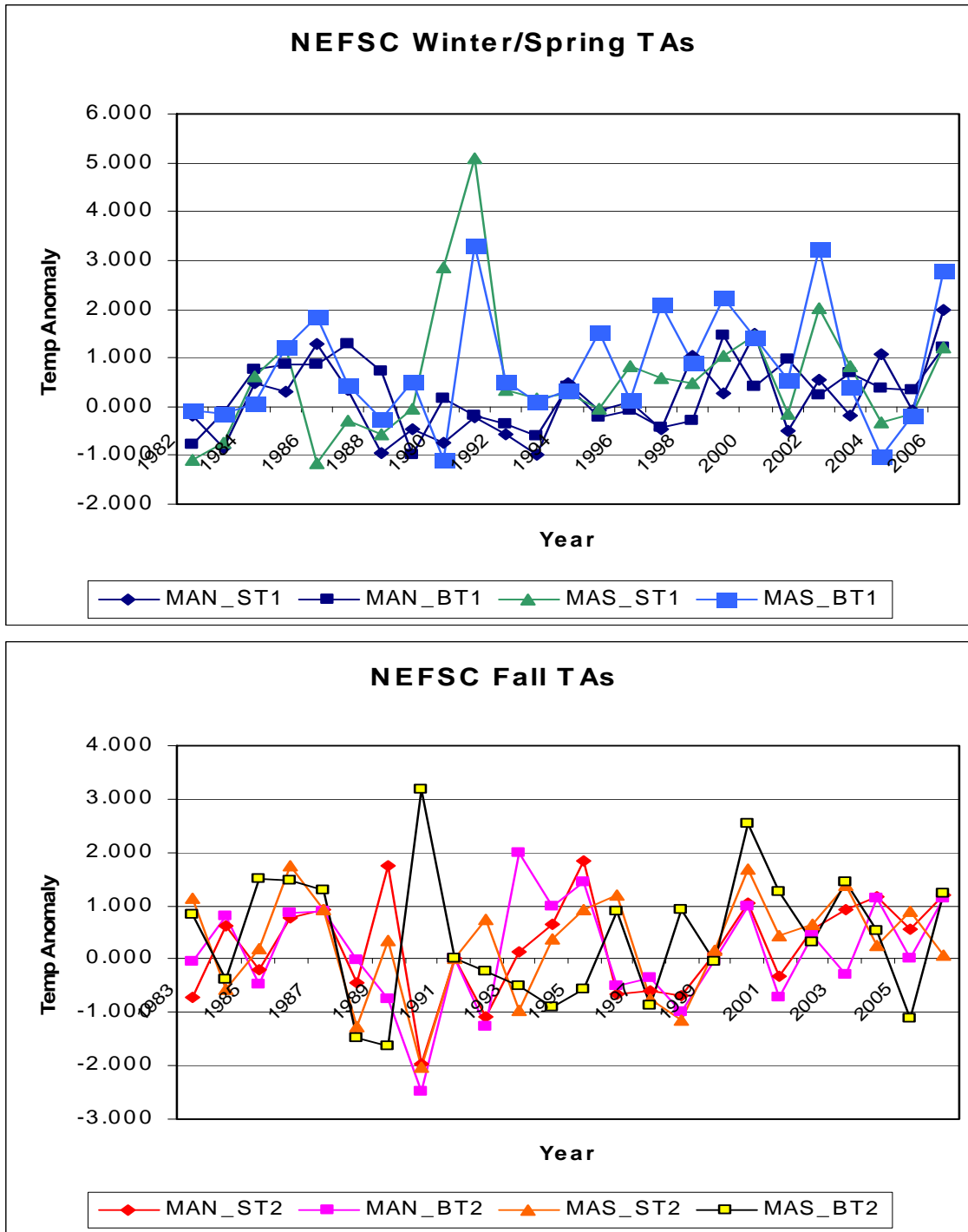


Figure 2. NEFSC survey Temperature Anomalies (TAs). Fall season anomalies are forward lagged to the next calendar year for correspondence with year class designation. MAN = Mid-Atlantic Bight North, MAS = Mid-Atlantic Bight South); ST = Surface Temperature, BT = Bottom Temperature; 1 = Winter/Spring= January-June, 2 = Fall= July-December.

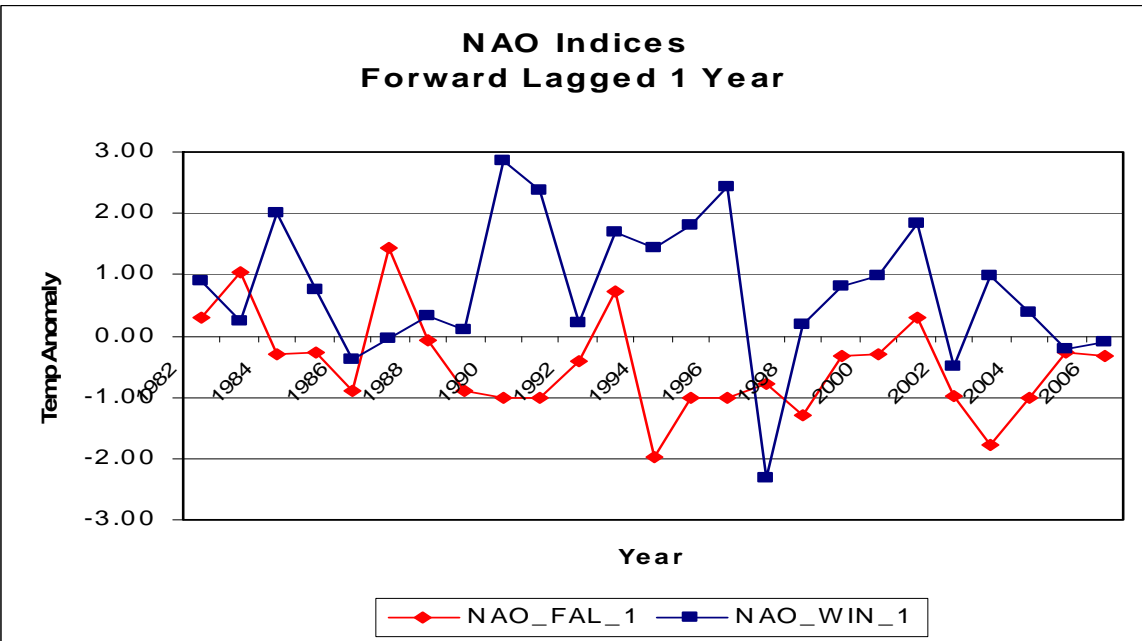
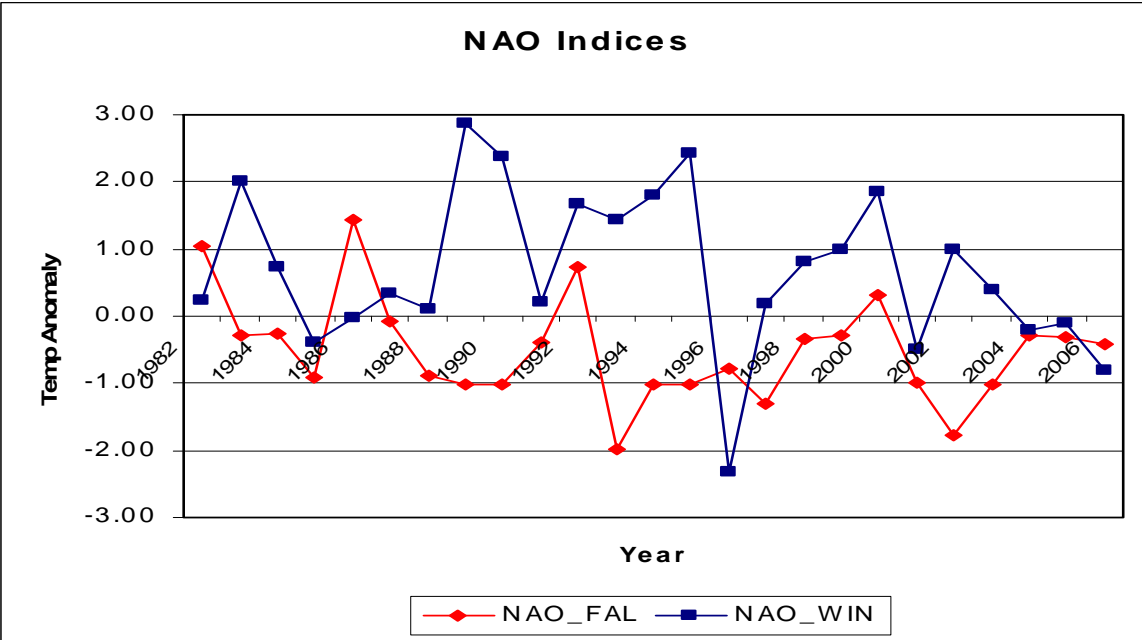


Figure 3. North Atlantic Oscillation (NAO) climate indices. Winter indices (NAO\_WIN) are December-March. Fall (NAO\_FAL) indices are September-November. Indices are also forward lagged one (\_1) and two (\_2) years because the NAO can produce both contemporary local and time-lagged, broad-scale physical changes.

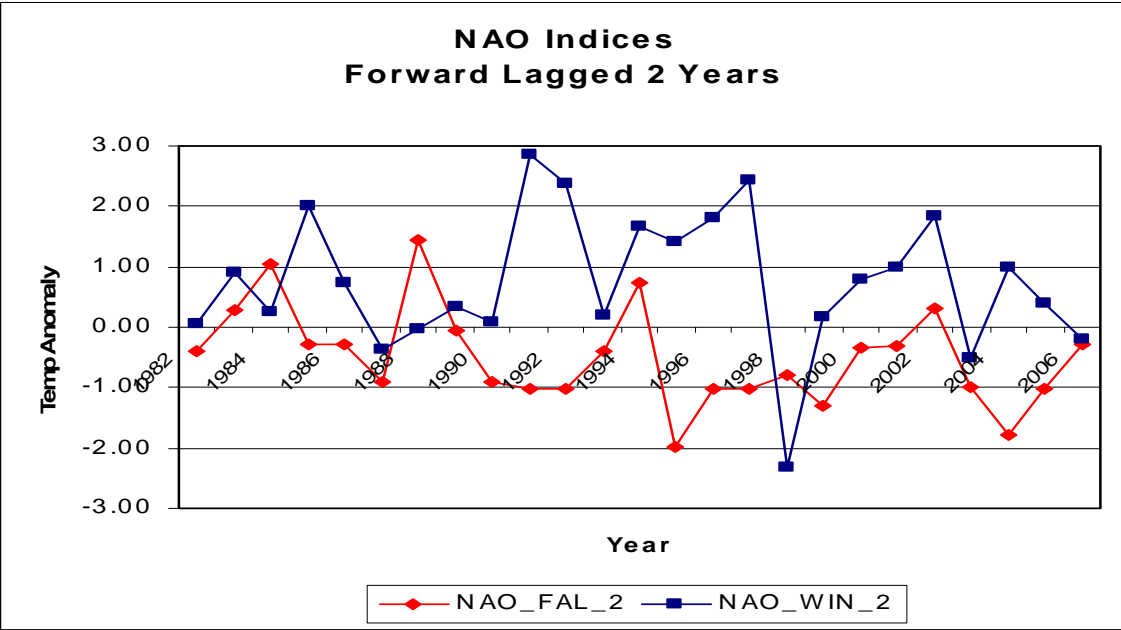


Figure 3 Continued.

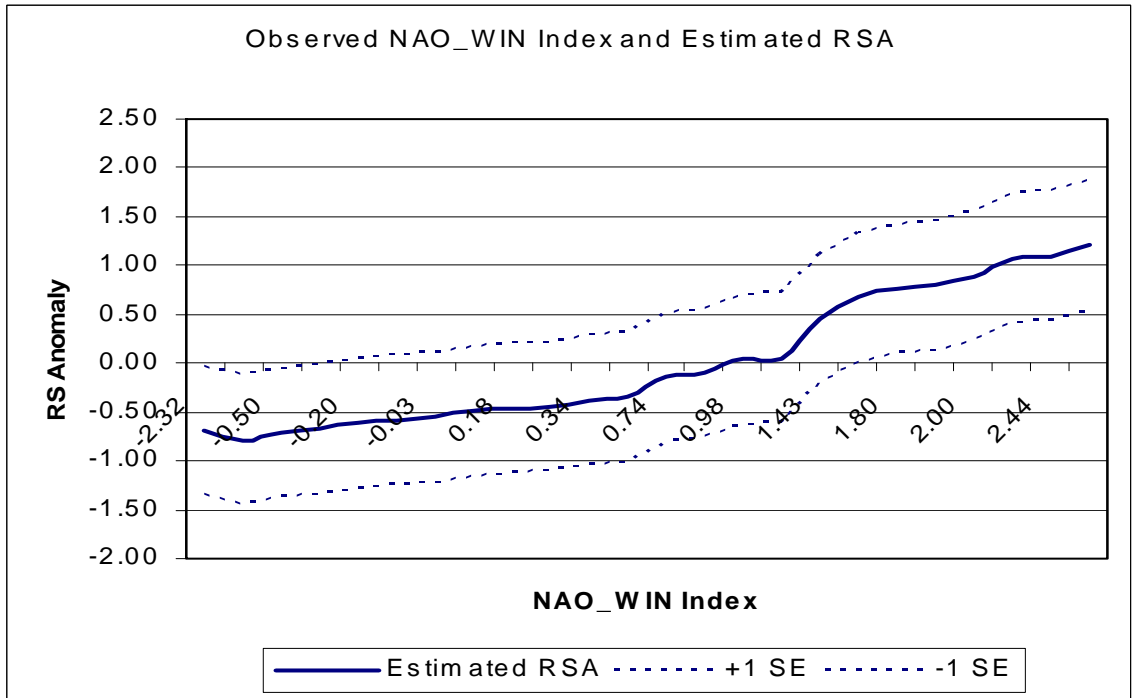
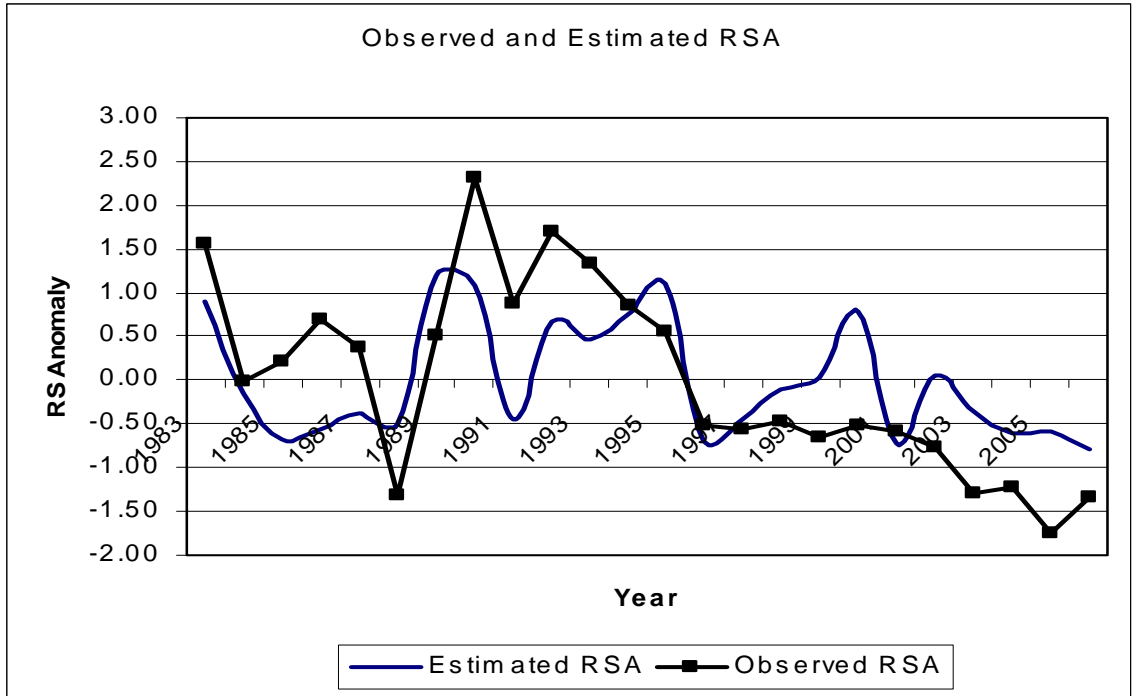


Figure 4. Results from the GAM1 regression and smoothing model of NAO\_WIN climate index and Recruit-Spawner Anomaly (RSA).

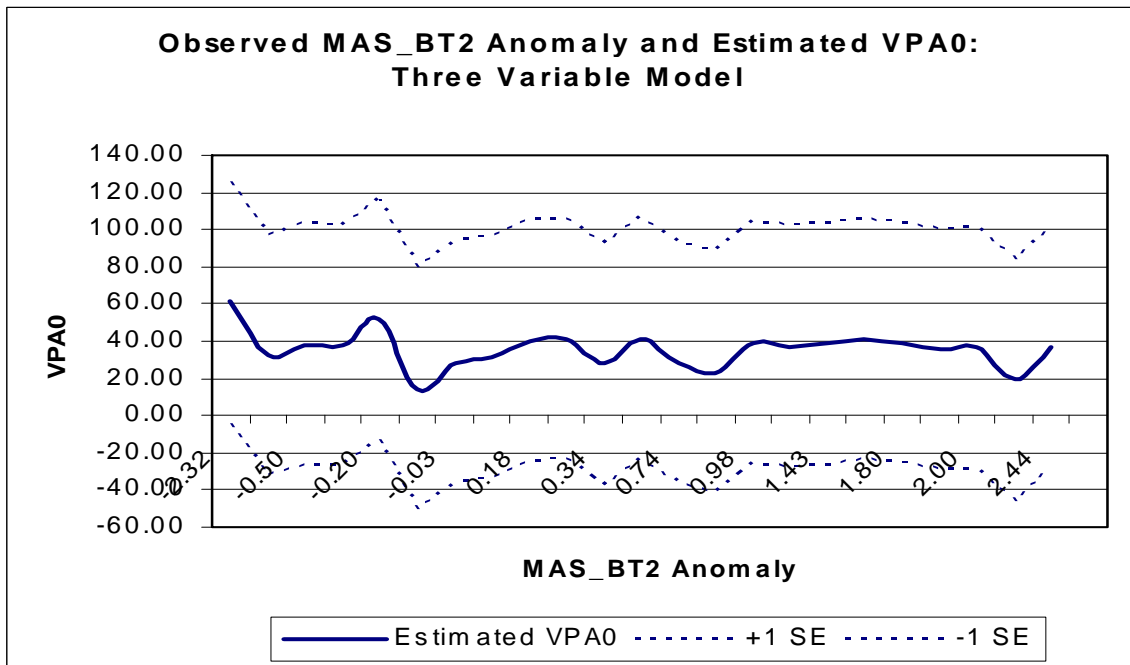
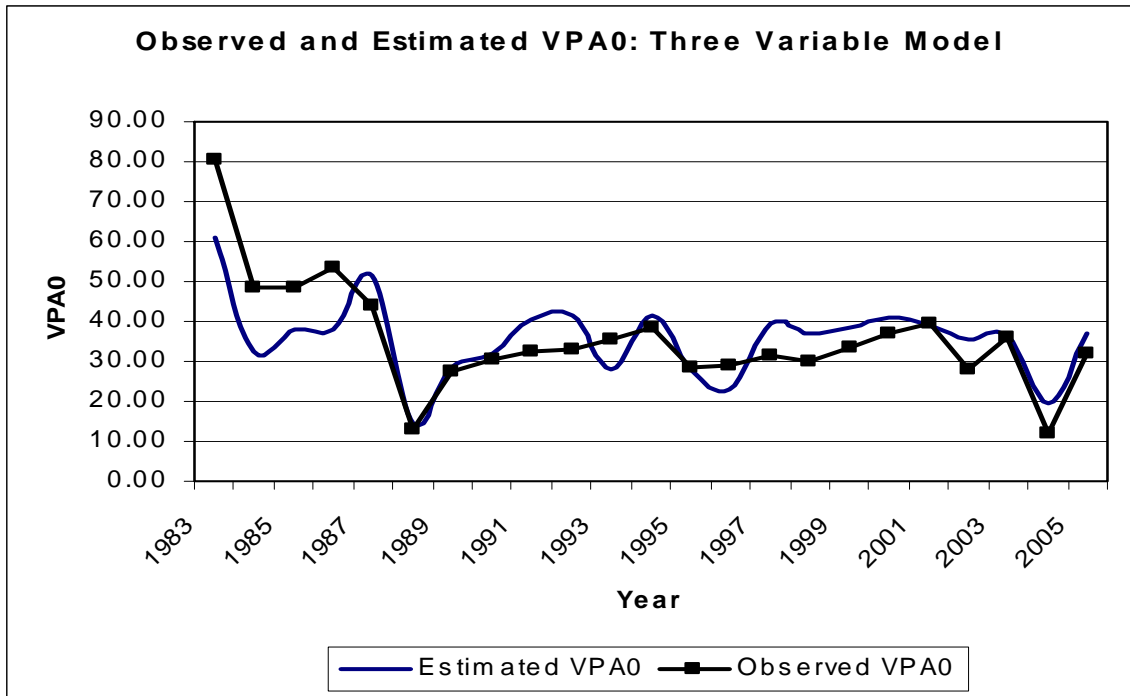


Figure 5. Results from the GAM2 regression and smoothing model of NAO\_WIN and NAO\_FAL\_1 climate indices and MAS\_BT2 temperature anomaly and Age 0 recruitment (VPA0).



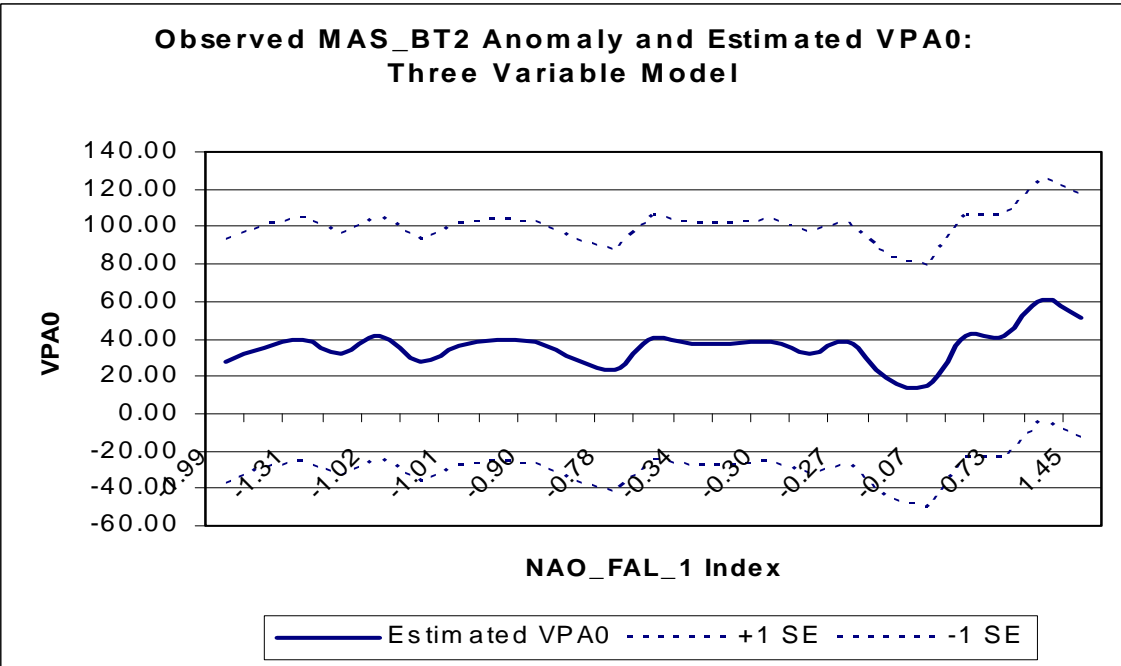
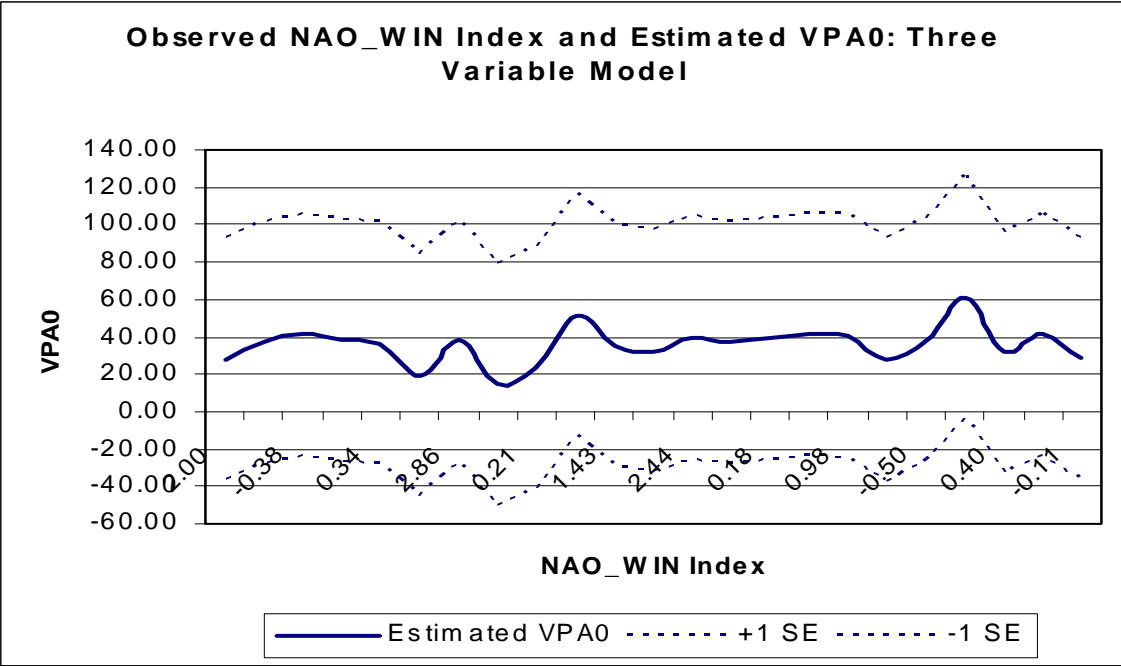


Figure 5 continued.

## Wavelet Analysis of Trends in Summer Flounder YOY and Spawner-Recruit Relationships

by Eric Powell

### Introduction

Two climatic signals are most significant in affecting oceanographic and estuarine processes in the Mid-Atlantic Bight, the North Atlantic Oscillation (NAO) and the Pacific North American (PNA). The NAO is closely related to the Arctic Oscillation (AO) and primarily affects temperature. The PNA has a well-described teleconnection with the El Niño-Southern Oscillation (ENSO) and is dominantly an effector of precipitation and, thus, freshwater inflow, in the northeast region. The NAO has a well-described 8-year cycle and indications of a 4-yr periodicity that are superimposed on longer-term trends. These periodicities are known to profoundly effect estuarine oyster populations, including recruitment and mortality.

### Methods

#### *Meteorological Data Sets*

Monthly values for the NAO and PNA indices were obtained from the National Weather Service Climate Prediction Center <sup>1</sup>. Both are obtained from a rotated principal component analysis using the monthly standardized 500-mb height anomalies obtained from the CDAS in the analysis region 20° N-90° N. Details are provided at the NOAA web site.

#### Analytical Approach

The time series technique of wavelet analysis was used. Application of this technique to oyster populations is described in Soniat et al. (2006), who reference a wide range of other applications of this technique. Wavelet analysis resolves localized variations in the strength of a signal (i.e., the wave) within a time series. With this approach, the original time series is decomposed into a time-frequency space, which allows the dominant components (i.e., the wavelets) that make up the wave to be identified. Soniat et al (2006) provide references to source the mathematical details of the technique. Earlier analyses by our group have evaluated the use of a number of mother wavelets (e.g., Paul, Morlet). The Morlet wavelets have good frequency resolution, but smear the dominant signals in the time domain. The Paul wavelets provide good time resolution, but smear the signals in the frequency domain. Comparison of the two show that, for applications of the type that follow, the Morlet wavelet provides adequate time resolution and superior frequency resolution over the results obtained from the Paul wavelet. As a consequence, the Morlet wavelet is used here.

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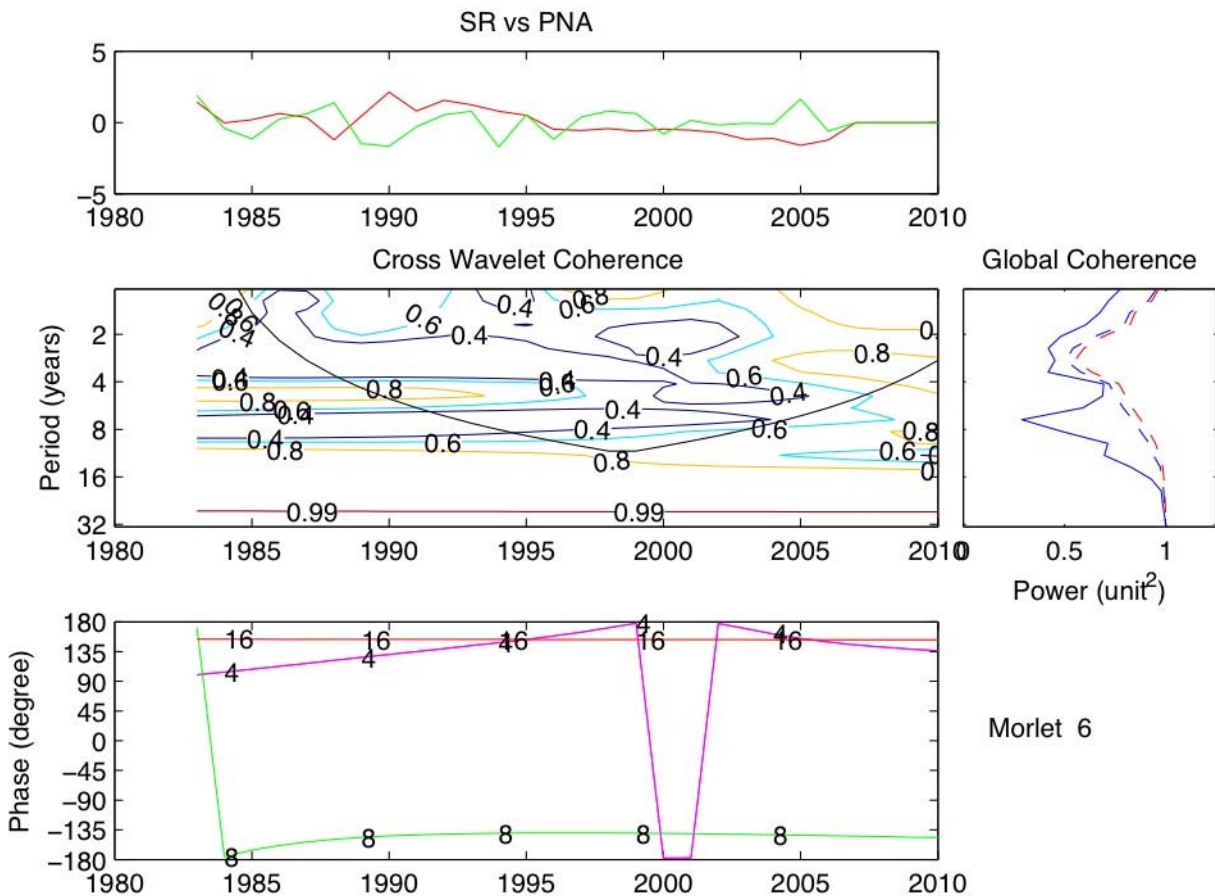
<sup>1</sup> [www.cpc.ncep.noaa.gov/products/precip/CWlink](http://www.cpc.ncep.noaa.gov/products/precip/CWlink)

*Fisheries data*

The fisheries data used are the spawning stock biomass (SSB) and recruitment estimates (VPA0) for summer flounder obtained as described by Terceiro<sup>2</sup>.

**Results**

Four wavelet analyses are reported as representative of a number of different analyses. Each is a cross-wavelet analysis, equivalent to a cross-correlational analysis, comparing either the NAO or PNA to either the VPA0 or VPA0/SSB (labeled 'SR' on the plots that follow) index.

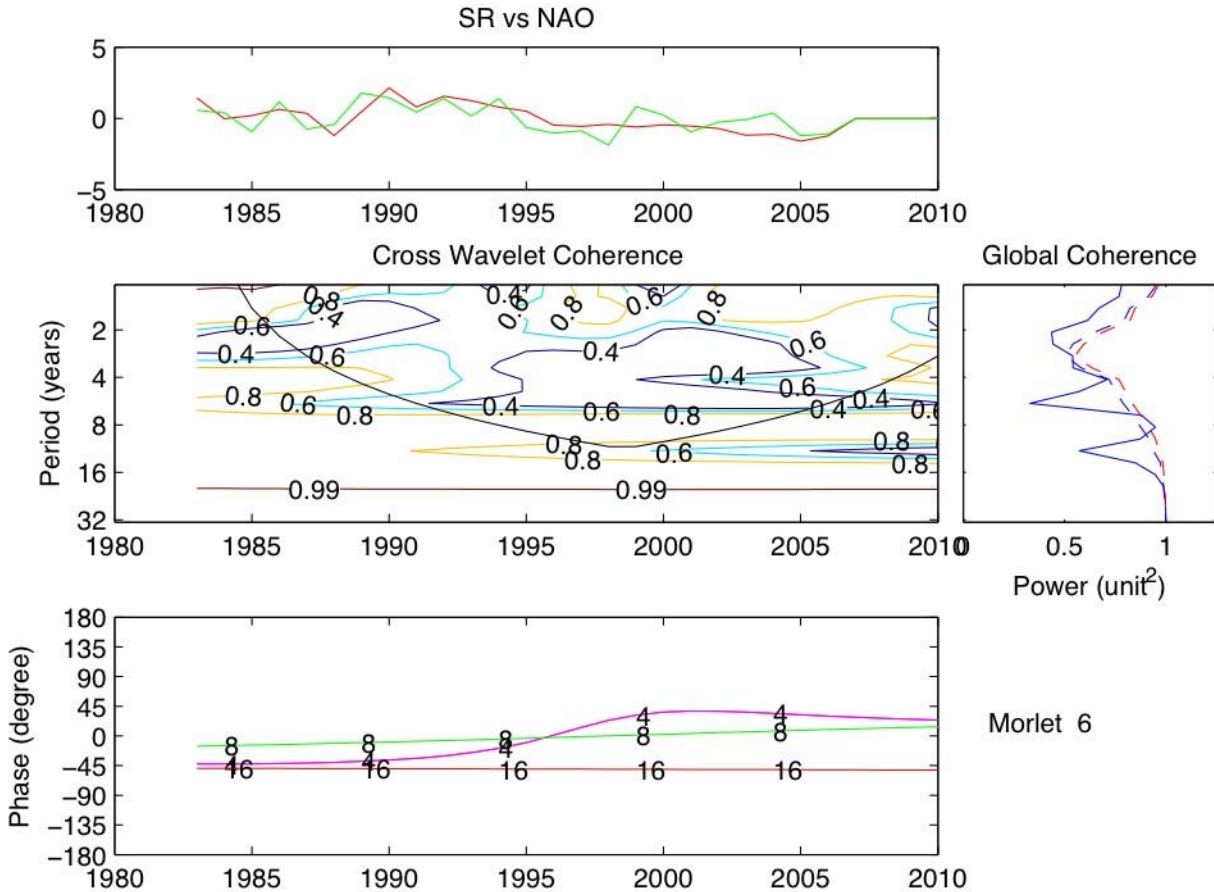


**Figure 1.** Cross-wavelet analysis between the VPA0/SSB (spawner-recruit) index and the PNA (Pacific North American) index.

Figure 1 shows the cross-wavelet analysis between the spawner-recruit index and the PNA. The top graph reports the data time series standardized to a mean of zero. The middle righthand graph labeled 'global coherence' reports the significance of periodicities from <1 to >16 years. The dashed lines on this graph identify the significance at the  $\alpha = 0.10$  (left dashed line) and  $\alpha = 0.05$  (right dashed line) levels. The time series is 24 years long. A rule-of-thumb is

<sup>2</sup> Working Paper: Modeling environmental factors and summer flounder recruitment success.

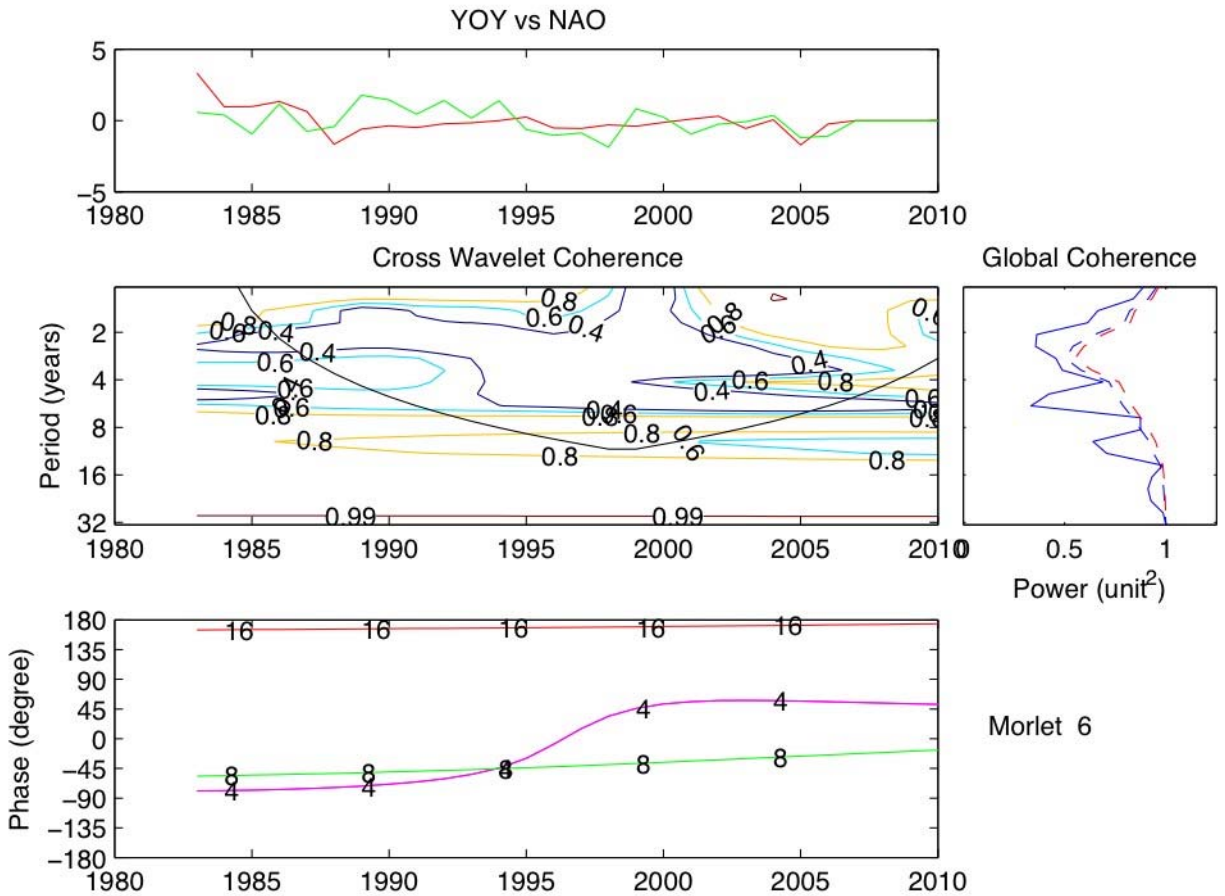
that no periodicity can be safely identified with a period that exceeds half the time series length, so that results exceeding 12 years should be ignored. In the case of the PNA and the spawner-recruit relationship, no significant periodic interaction is found. Other analyses, not figured here, also failed to find any relationship with the PNA and recruitment (VPA0).



**Figure 2.** Cross-wavelet analysis between the VPA0/SSB (spawner-recruit) index and the NAO (North American Oscillation) Index.

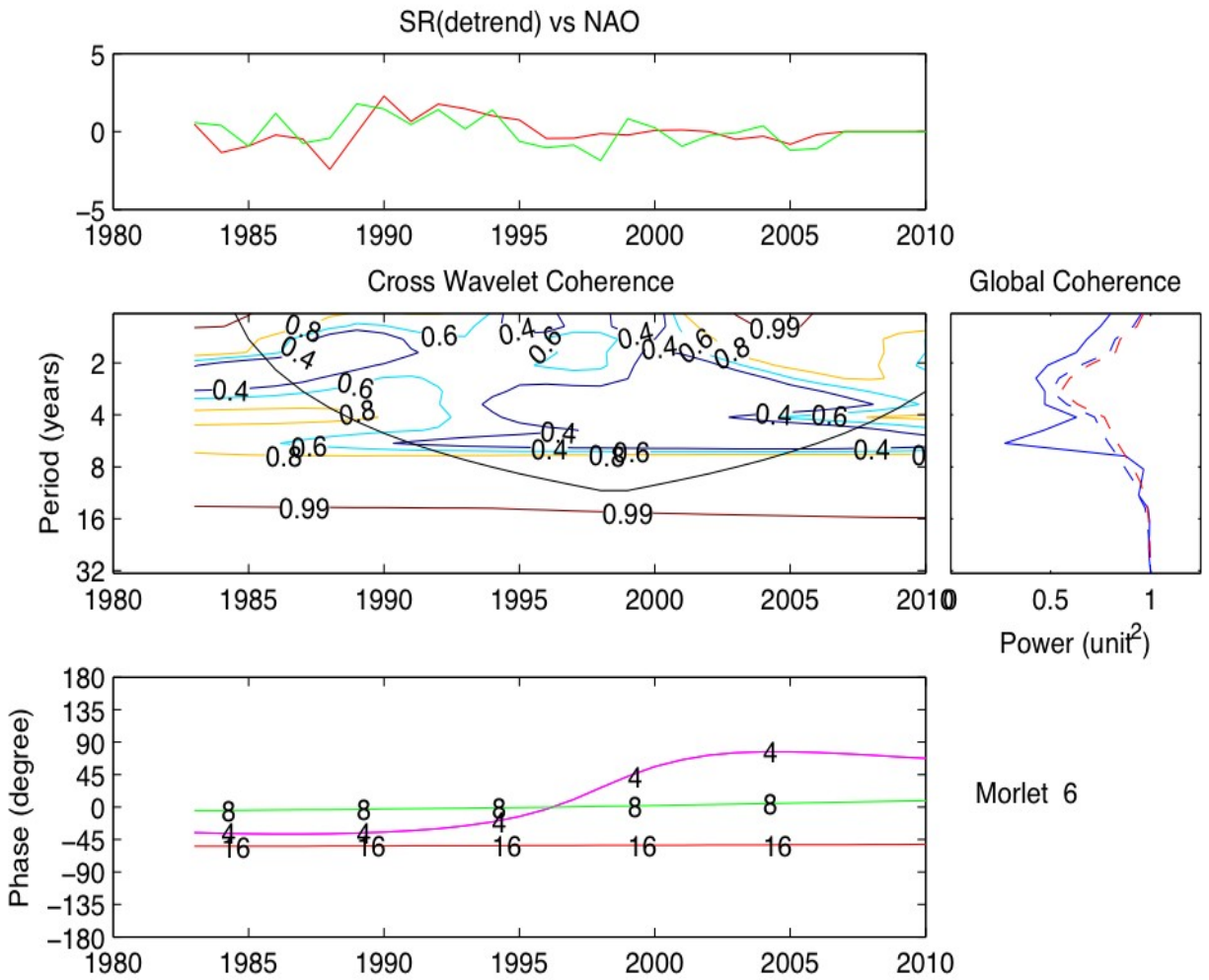
Figure 2 shows results of the cross-wavelet analysis for the spawner-recruit index and the NAO. The analysis shows two significant coherences, at 4 years and 8 years (middle, right plot labeled 'global coherence'). These same two periodicities are significant in other species we have examined such as oysters. The lower plot shows the phase relationships, with the first variable leading the second. Thus, the 8-year periodicity has a phase of near 0. Highs in NAO and the spawner-recruit index more or less coincide. The 4-yr periodicity shows a strong shift in phase between 1995 and 2000. Prior to 1995, the phase was  $-45^\circ$ . That is, NAO led the spawner-recruit relationship by  $4 \times (45^\circ / 360^\circ) = 0.5$  yr. After 2000, the two periods were nearly synchronous.

Figure 3 shows the results of cross-wavelet analysis between the VPA0 index and NAO. The 8-year signal is significant and the 4-yr signal barely so. The phase shift in the 4-year signal is dramatic.



**Figure 3.** Cross-wavelet analysis between the VPA0 index and the NAO (North American Oscillation) Index.

The spawner-recruit index has a long-term downward trend that might affect the wavelet analysis. A final analysis was conducted with this trend in the spawner-recruit relationship removed prior to analysis. Figure 4 shows that the 8-year periodicity remains strongly significant. The 4-year periodicity is no longer significant, although the phase shift remains apparent.



**Figure 4.** Cross-wavelet analysis between the VPA0/SSB index and the NAO (North American Oscillation) Index, with the spawner-recruit relationship de-trended prior to analysis.

### Conclusions

No evidence exists for a relationship between the PNA and summer flounder recruitment. On the other hand, a relationship between the NAO and summer flounder recruitment is strongly supported. The 8-year periodicity, the dominant periodicity in the NAO, is identified as significantly correlated with an 8-year periodicity in the recruitment indices in all analyses. The significance level consistently exceeds  $\alpha = 0.05$ . No substantive phase shift occurs. The two periodicities are in near-synchrony so that high NAO and high recruitment indices occur more or less simultaneously.

In most analyses, a 4-year periodicity also occurs, although sometimes at a weaker level of significance. This interaction is consistently associated with a phase shift between 1995 and 2000. Such phase shifts are frequently associated with substantive long-term changes in population dynamics. However, this periodicity was no longer significant after the long-term trend in the spawner-recruit data was eliminated. This suggests that the interaction of the two time series was primarily associated with subsets of the time series record. A detailed

examination of the coherence over the time series suggests that the 4-year periodicity was stronger pre-1995 and post-2000 and that the phase shift was coincident with a decline in the significance of this periodicity during the intervening years.

The NAO is consistently associated with temperature shifts in the North Atlantic. The present analysis suggest that some portion of the variability in summer flounder recruitment since 1982 can be explained by this climate forcer and its expression in changes in the temperature regime experienced by the fish.

I have not included a long list of references. Those interested in further information on wavelet analysis are directed towards the references contained in Soniat et al. (2006) [Soniat, T.M., J.M. Klinck, E.N. Powell and E.E. Hofmann. 2006. Understanding the success and failure of oyster populations: Climatic cycles and *Perkinsus marinus*. *J. Shellfish Res.* 25:83-93]. A recent review of the NAO/AO that provides access to this literature is Cohen and Barlow (2005) [Cohen, J. and M. Barlow. 2005. The NAO, the AO, and global warming: how closely related? *J. Climate* 18:2298-4513].

## APPENDIX 7

### SAW 47 Working Paper 13 (TOR 7) – GARM Reference Point Paper

Draft Working Paper for Pre-Dissemination Peer Review Only.  
Working Paper 1.1 April 22, 2008

#### Specifying Initial Conditions for Forecasting When Retrospective Pattern Present

by  
Chris Legault and Mark Terceiro

A Working Paper in Support of GARM Reference Points Meeting Term of Reference 1

*This information is distributed solely for the purpose of pre-dissemination peer review.  
It has not been formally disseminated by NOAA.  
It does not represent any final agency determination or policy.*

GARM 2008 Reference Points Meeting  
Woods Hole, MA  
28 April – 2 May

#### Summary

There is currently no generally agreed methodological approach to adjusting projections to account for retrospective patterns in the stock assessment. This paper presents three alternative approaches and compares the resulting time series of spawning stock biomass, landings, and fishing mortality rate based on a summer flounder-like stock assessment. The three adjustments for retrospective patterns all reduce landings in the quota setting year, but the magnitude of the reduction is quite variable and the implications for future years in the projections are quite different. Adjusting the fishing mortality rate in the quota setting year is not recommended in the context of rebuilding programs because the future catches are greater than the unadjusted projections. Adjusting all ages in the starting population creates the largest decrease in projected catch, but typically cannot be justified based on the patterns observed at age. Making adjustments to the starting population based on the age specific retrospective patterns produces the most consistent approach, although the overall impact is relatively minor. A number of technical questions remain regarding exactly how to compute the retrospective adjustments at age. Management strategy evaluation work is required in the future to determine if any adjustment method performs better than the others.



## Introduction

Term of Reference 1 for the GARM 2008 Biological Reference Points meeting is for relevant stocks, determine the influence of retrospective patterns in parameter estimates (e.g., fishing mortality, biomass, and/or recruitment) from assessment models on the computation of BRPs and on specification of initial conditions for forecasting.

This paper addresses only the latter aspect of this TOR, methods for adjusting initial conditions for forecasting when the stock assessment exhibits a retrospective pattern.

There is currently no generally agreed methodological approach to adjusting projections to account for retrospective patterns in the stock assessment. Two types of approaches that have been tried are: 1) adjust the TAC by the amount of retrospective seen in the SSB and 2) adjust the initial population to account for the retrospective pattern. The first approach can also be constructed by adjusting the fishing mortality rate in the quota year to account for the retrospective pattern observed in  $F$ . These two approaches will produce similar changes in the quota for next year, but have widely different implications for rebuilding strategies. This is because the first approach does not adjust the population, so the reduction in quota will actually allow the population to grow more and allow more fishing during the rest of the rebuilding period. In contrast, the second approach has a compounding effect, forcing a reduction in  $F$  during the rebuilding because the initial population abundance is further away from the target than the unadjusted population. The second approach is consistent in how the retrospective adjustment impacts the projections and is favored over the first approach.

There remain a number of technical issues for how to make the adjustment to the initial population abundance. All ages in the initial population could be scaled according to some average retrospective change, or else age-specific retrospective adjustments could be applied. The calculation of the average retrospective change can also be done numerous ways, as an average of the one-year update from the last five years or as the average change from the original to the most recent assessment result from the last five years, for example. Even more complex derivations can be made to fill in how much change is expected to occur based on regression of previous changes. There was insufficient time to address these issues through management strategy evaluations (MSE), the tool needed. Instead, a number of examples are provided to demonstrate the magnitude of effect that can occur when retrospective adjustments are made.

## Methods

A stock assessment similar to the summer flounder 2007 assessment was used as the basis for all comparisons. This assessment demonstrated a strong retrospective pattern with  $F$  adjusted higher and SSB adjusted lower with additional years of data (Figure 1). The SSB target for rebuilding was determined to be 89,411 metric tons. A catch of 7,762 metric tons was assumed to be caught in 2007, the quota for that year. An iterative search found the constant  $F$  needed to rebuild the stock to the SSB target in year 2012 with 50% probability when no adjustments were made to the initial population to account for the retrospective pattern (Frebuild).

Retrospective adjustments were made in three different ways:

1. The  $F$  in 2008 was adjusted from Frebuild
2. The initial population abundance at age in 2007 was reduced over all ages at the same rate

3. The initial population abundance at age in 2007 was reduced by age-specific rates

The F adjustment was made based on the average of the last 5 years single year update retrospective, meaning a 28% reduction in F2008. When the initial population abundance at age in 2007 was reduced over all ages at the same rate, the same reduction as case 1 was applied, meaning the numbers at age at the start of 2007 were all reduced by 28%. This was selected as a compromise between the lower one year adjustments to SSB and the higher full year adjustments to SSB, and to allow more direct comparison between cases 1 and 2. The third case adjusted all ages based on the age specific one year adjustments averaged over the last five years, which resulted in both increases and decreases to the initial population abundance in 2007 (Table 1).

## Results

Time series of spawning stock biomass (thousand metric tons), landings (thousand metric tons), and fully selected fishing mortality rate are presented in both Table 2 and Figure 2. The landings in 2007 are assumed constant for all four runs. The median spawning stock biomass in 2012 was the target and the fishing mortality rates were solved to an extreme number of digits to ensure complete consistency with the SSB<sub>msy</sub> target in 2012. The Base and adj F cases have the same starting population and thus the same F in 2007, while the two adj N cases have lower starting populations which require higher F in 2007 to achieve the landings. The three retrospective adjustment approaches all reduce landings in 2008 relative to the Base case. However, the adj F case then allows landings to increase above the Base case for the remaining years because the stock has been fished lighter in 2008. This increase in landings for years 2009-2012, causing the adj F case to have the highest total landings over all years. The two adj N cases both have lower catches for years 2008-2012 relative to the Base case due to starting at a lower initial stock abundance. However, the adj N by age case has nearly the same level of landings in years 2009-2012 as the Base case (less than 5% difference). This similarity is due to the large changes in retrospective adjustment occurring for the oldest ages, which wash out of the projections relatively quickly. In contrast, the adj N all ages case reduces all cohorts significantly, requiring a greater number of years to remove their impact in the projections.

## Discussion

In most of the groundfish assessments examined to date, the retrospective patterns are most pronounced for the oldest ages and least pronounced for the youngest ages. This means that adjusting all ages with the same factor is not warranted. Making the age-specific adjustments will cause the short-term catch to decrease, but the effect will not last long in most cases.

There are many other ways that the retrospective adjustments could be formed. For example, the full adjustment relating the shorter time series to the full time series could be used. Other approaches could be used to estimate the corrections for incomplete cohorts and then create the average retrospective adjustment on similar time periods. However, none of the approaches have been tested using management strategy evaluations.

One question that inevitably arises when dealing with retrospective patterns is “What happens if the retrospective pattern goes away or changes direction?” In these cases, adjusting for the retrospective pattern will be worse than not adjusting. However, while changes in direction of retrospective patterns have been observed in some stocks, they are the exception.

Table 1. Average of the most recent 5 years of single year adjustments in retrospective pattern observed by age.

<u>Age Retro Change</u>	
0	4.8%
1	4.8%
2	4.2%
3	-0.4%
4	-6.0%
5	3.2%
6	-65.5%
7	-26.8%

Table 2. Comparison of median spawning stock biomass, landings, and fishing mortality rate time series for the unadjusted (Base) and three alternative approaches to adjusting for retrospective patterns: F, N all ages, and N by age.

<u>Spawning Stock Biomass (thousand metric tons)</u>				
Year	Base	adj F	adj N all ages	adj N by age
2007	51.719	51.719	35.068	47.005
2008	61.535	63.644	44.193	58.433
2009	70.123	72.113	56.044	68.188
2010	78.314	79.666	68.438	77.169
2011	83.796	84.457	78.846	83.219
2012	89.411	89.411	89.411	89.411

<u>Landings (thousand metric tons)</u>				
Year	Base	adj F	adj N all ages	adj N by age
2007	7.762	7.762	7.762	7.762
2008	7.936	5.851	3.831	7.108
2009	9.583	10.312	4.976	9.048
2010	10.882	11.643	6.303	10.644
2011	12.366	12.957	7.849	12.145
2012	13.155	13.644	9.069	13.013

<u>Fishing Mortality Rate</u>				
Year	Base	Base adj F	adj N all ages	adj N by age
2007	0.227	0.227	0.330	0.255
2008	0.198645	0.1430244	0.14069	0.197615
2009	0.198645	0.205265	0.14069	0.197615
2010	0.198645	0.205265	0.14069	0.197615
2011	0.198645	0.205265	0.14069	0.197615
2012	0.198645	0.205265	0.14069	0.197615

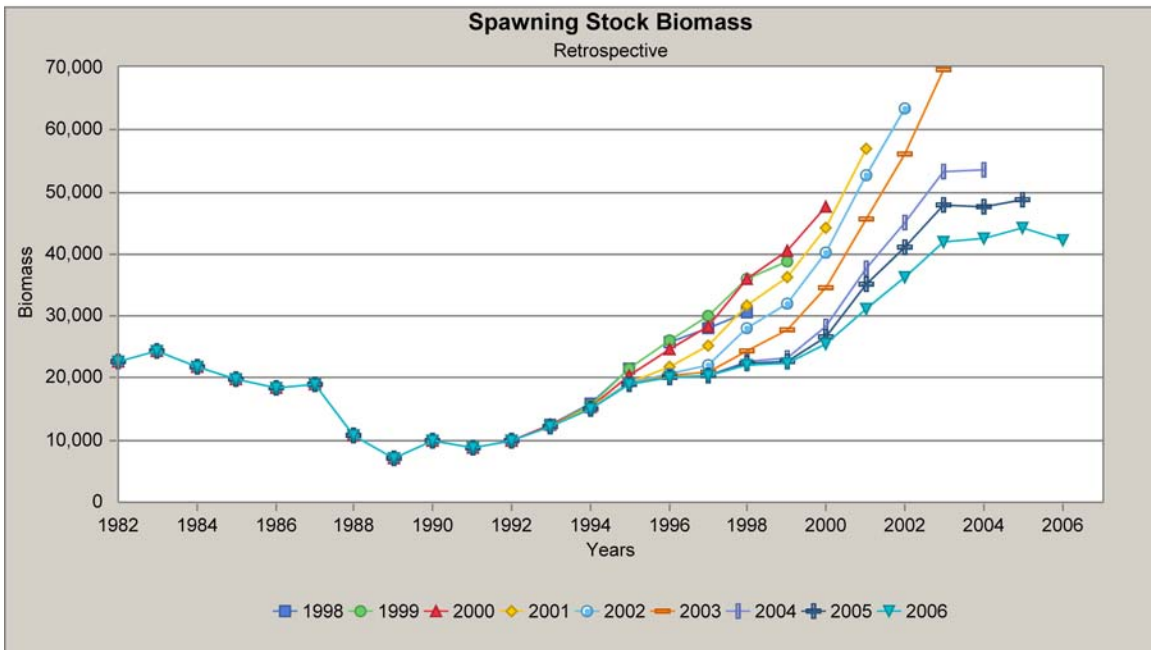
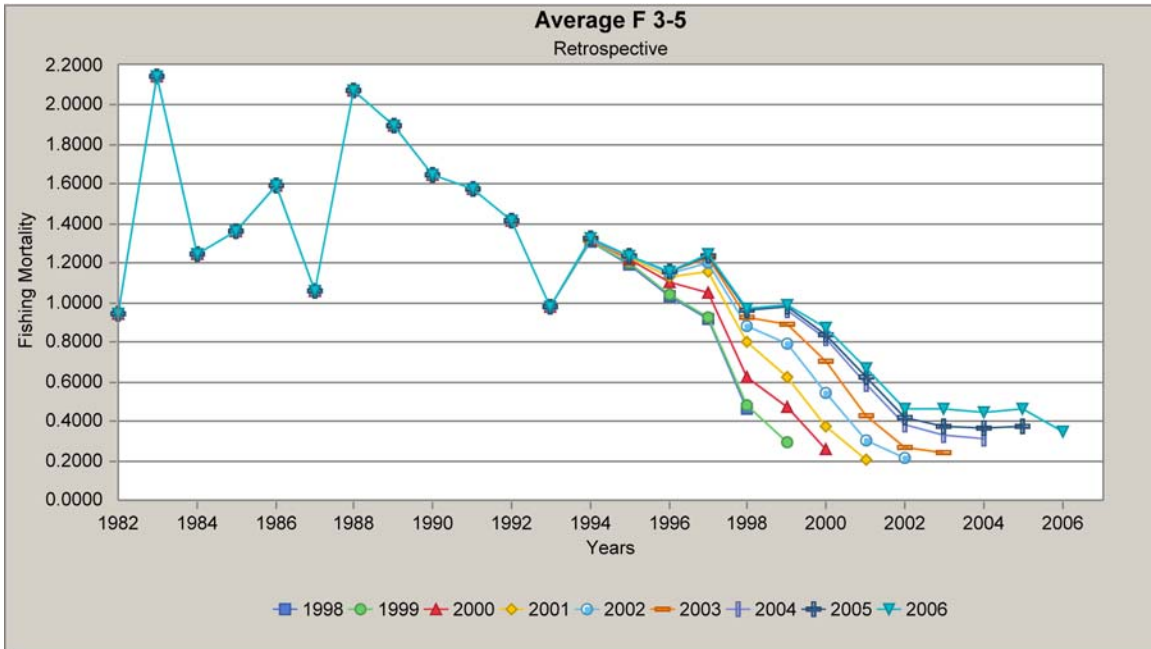


Figure 1. Retrospective patterns in average fishing mortality rate and spawning stock biomass for the example stock assessment.

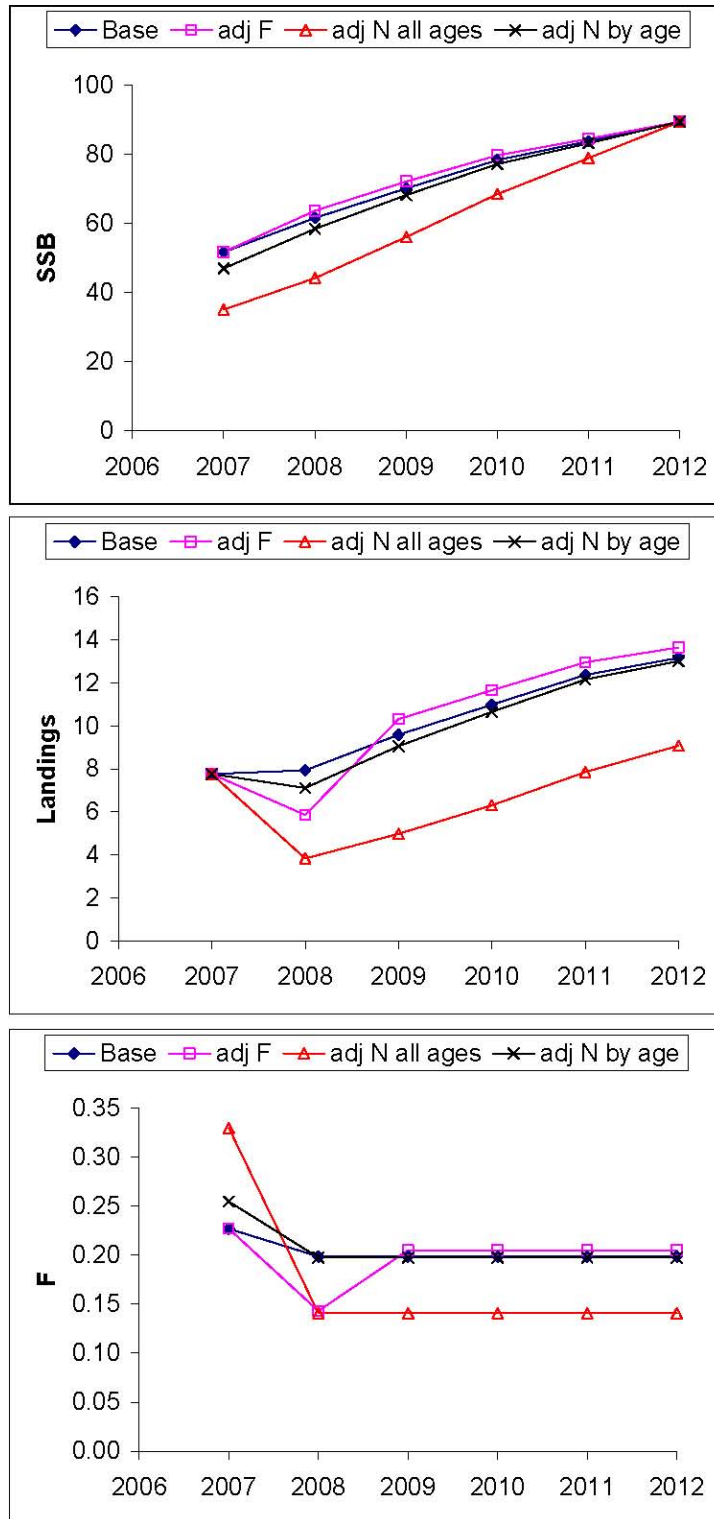


Figure 2. Comparison of median spawning stock biomass, landings, and fishing mortality rate time series for the unadjusted (Base) and three alternative approaches to adjusting for retrospective patterns: F, N all ages, and N by age.